JUNE 1948
Volume 35 No. 6

Plating

THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY

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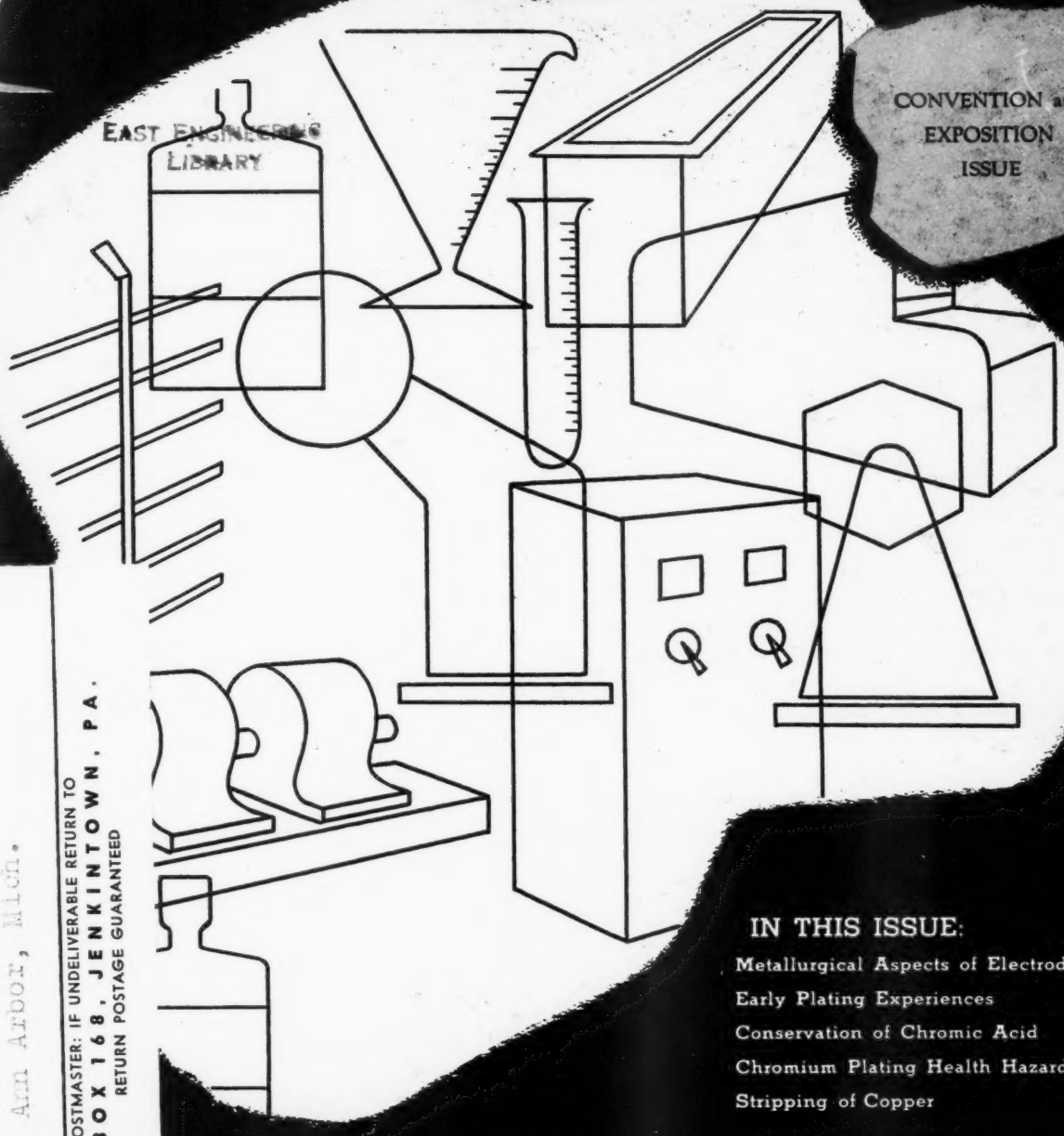
CONVENTION and EXPOSITION ISSUE



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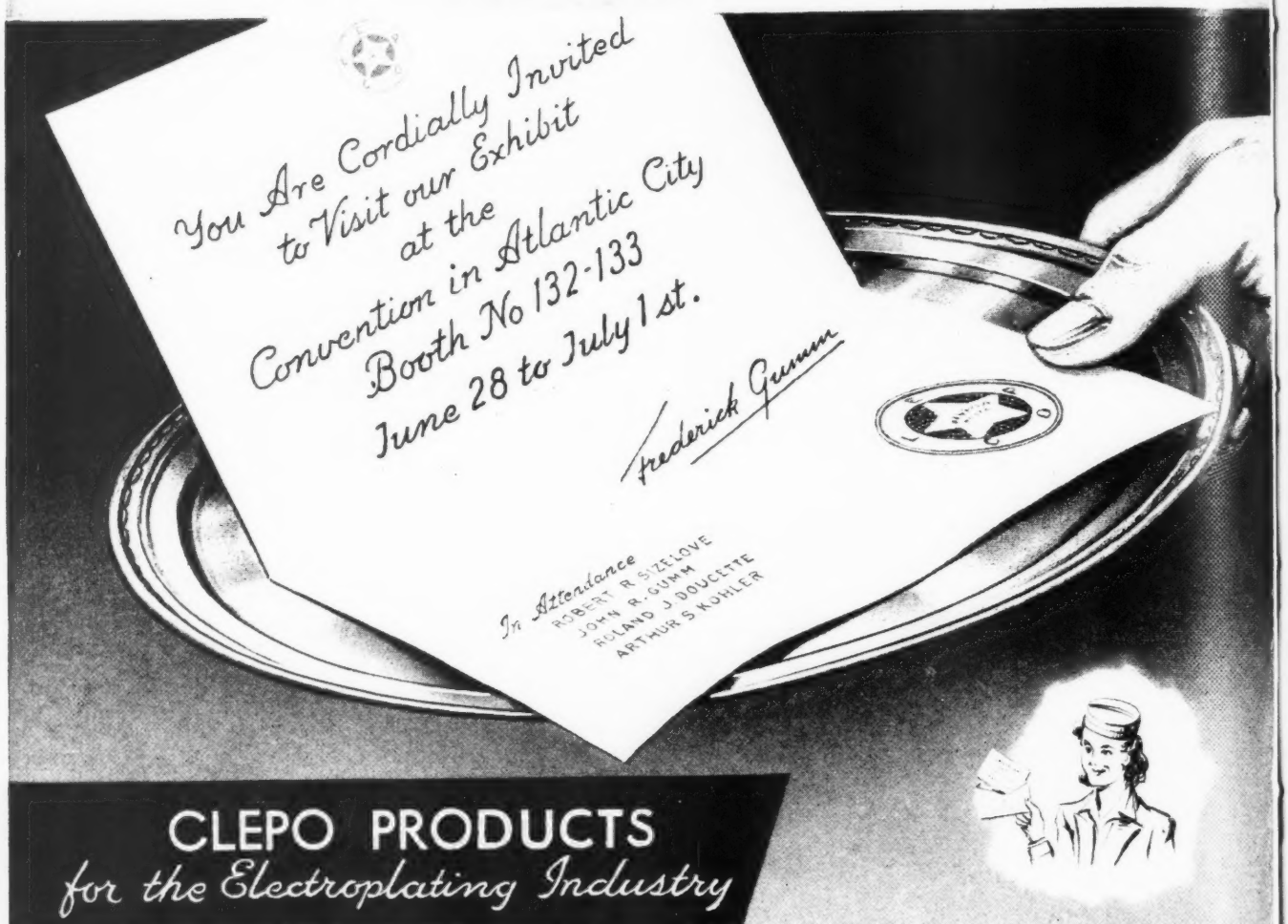

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for the Electroplating Industry

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for Barrel Tumbling

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for Finishing Aluminum

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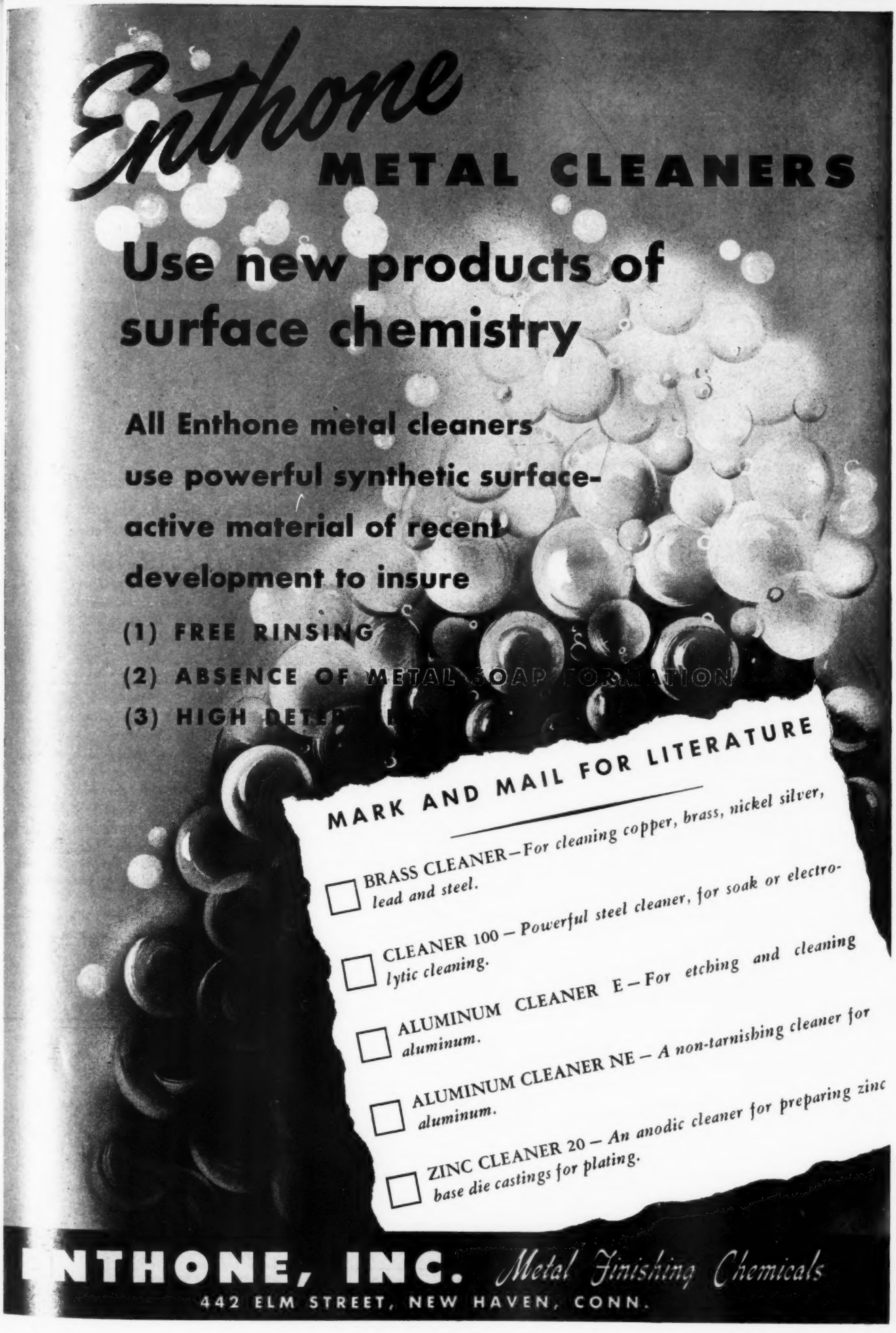
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83

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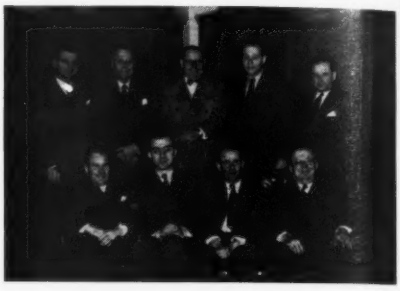
Address _____

JUNE • PLATING

Industry News

Wyandotte Chemicals Regional Supervisors recently held a week's conference at the home office. Plans were made with Carter B. Robinson, Vice-President in Charge of Sales, for the seven sales meetings now being held for the more



than 200 representatives of the J. B. Ford Division of the Wyandotte organization.

One of the highlights of the conference was a plant trip to several new manufacturing units which comprise the $25,000,000 Expansion Program of Wyandotte Chemicals Corporation.

Corrosion Meeting. The Pittsburgh International Conference of Surface Reactions to be held in Webster Hall Hotel, Pittsburgh, Pa., on June 7–11, will feature nine sessions sponsored by the Corrosion Division of the Electrochemical Society, the Pittsburgh Section of the American Chemical Society, the Pittsburgh Chapter of the American Society for Metals, the University Corrosion Conference, the Physical Society of Pittsburgh and the National Association of Corrosion Engineers.

Among the subjects for the symposia are "Theory of Oxidation and Surface Reactions", "Preparation of Surfaces", "New Methods and Results".

A number of distinguished corrosion chemists from all over the world are expected to attend.

The De Greneer Corporation, Chicago, has become the representative in the greater Chicago area for the Alvey-Ferguson Company, Cincinnati, manufacturers of custom-built equipment for cleaning, rinsing, drying and pre-finishing metal parts and products.

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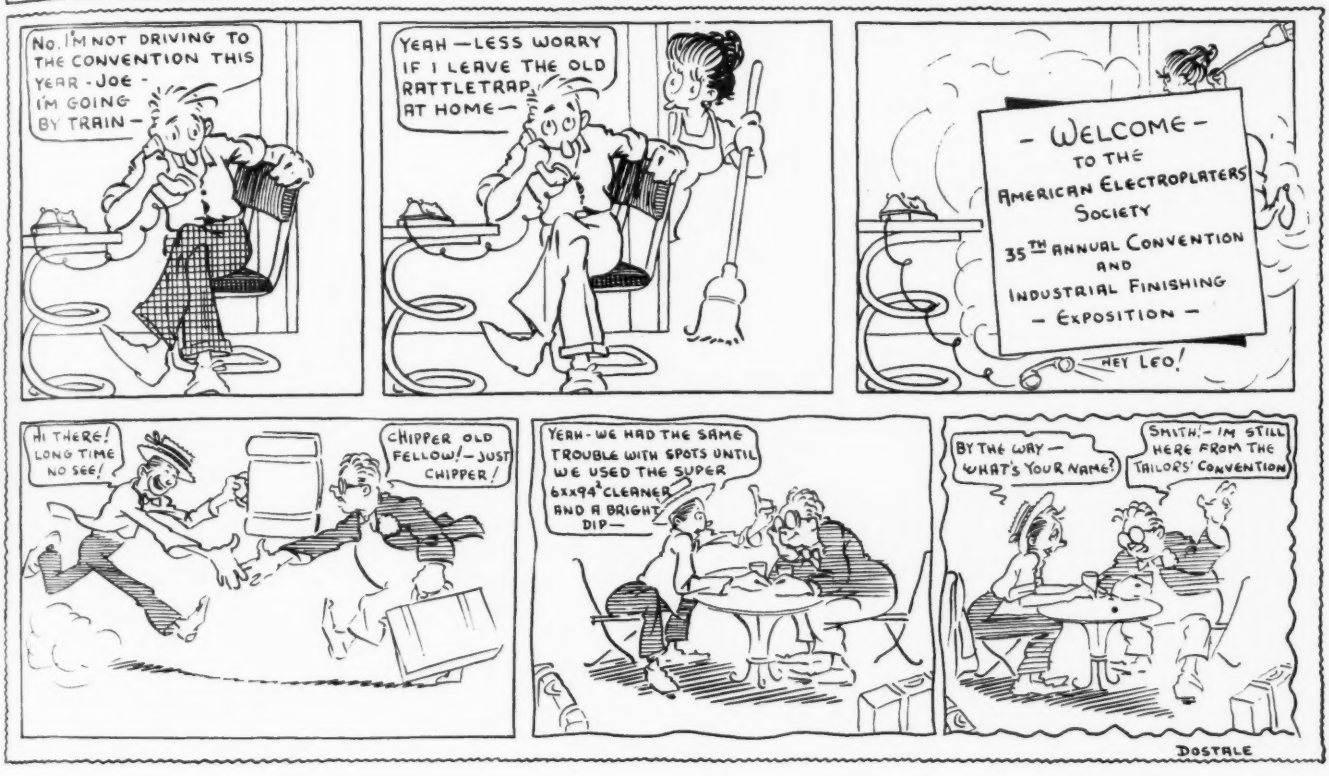
STRICKLY CONVENTIONAL


NO. I'M NOT DRIVING TO THE CONVENTION THIS YEAR - JOE - I'M GOING BY TRAIN -
YEAH — LESS WORRY IF I LEAVE THE OLD RATTLETRAP AT HOME —
- WELCOME - TO THE AMERICAN ELECTROPLATERS SOCIETY 35TH ANNUAL CONVENTION AND INDUSTRIAL FINISHING - EXPOSITION -
HEY LEO!
HI THERE! LONG TIME NO SEE!
CHIPPER OLD FELLOW! - JUST CHIPPER!
YEAH - WE HAD THE SAME TROUBLE WITH SPOTS UNTIL WE USED THE SUPER 6xx94² CLEANER AND A BRIGHT DIP —
BY THE WAY — WHAT'S YOUR NAME?
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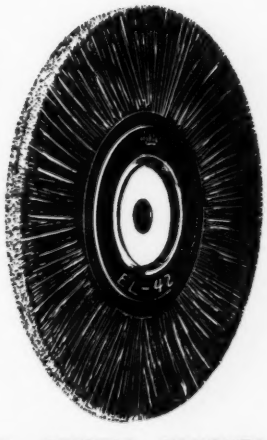
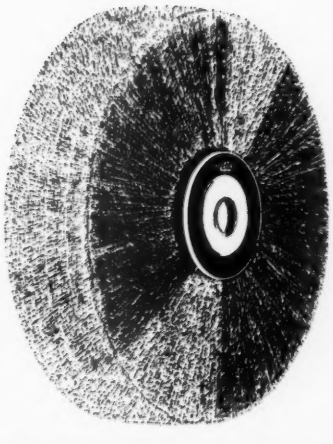


EL BRISTLE BRUSHES



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GOBLET BRUSHES

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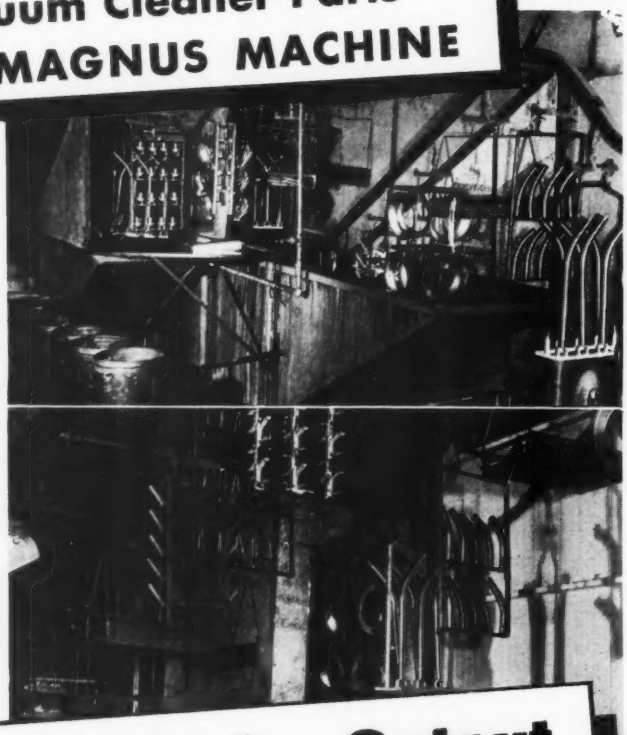
Seven Stages of Cleaning For Vacuum Cleaner Parts In this MAGNUS MACHINE



Stage 1 . . . Precleaning

Stage 7. . . Drying

DOUBLE the Output with HALF the Labor

THIS multi-stage, special cleaning machine was designed to handle the 412 component parts of a famous vacuum cleaner, replacing hand cleaning operations which required eight men. The machine, with four men, turns out twice as much work. Cleaning that used to take 1¾ hours is done in five minutes!

Parts go through the machine on an overhead conveyor. In Stage 1 they are precleaned in Magnusol (the Emulso-Dip Process). Stage 2 drains the parts. At Stage 3, a 40 lb. cold water spray knocks off loosened dirt, grease and oil, readying the parts for spray washing with a mild Magnus alkaline cleaner in Stage 4. Stage 5 provides a hot water spray rinse, followed by Stage 6, a cold air blast to remove clinging water particles. Stage 7 is a final drying operation at 200° F. Parts are then ready for finishing.

The Magnus line of metal cleaning machines includes both standard batch units and specially designed machines to fit into the production line.

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CLEANERS • EQUIPMENT • METHODS

Industry News

Nickel Consumption in Plating. According to the Annual Report of Robert C. Stanley, President, to the shareholders in The International Nickel Company on April 28, the amount of nickel used in nickel plating during 1947 in Canada and the United States was approximately 22,000,000 pounds, which exceeded the highest pre-war consumption by about 8,000,000 pounds. Sales of nickel in all forms in 1947 were 205,278,868 pounds, comparable with 201,103,234 pounds in 1946. Hence, close to 11 per cent of the nickel produced in 1947 was used for nickel plating.

Effective January 1, 1948, the United States price for electrolytic nickel from the Port Colborne, Ontario, refinery dropped from 35 cents per pound to 33¾ cents per pound.

The Nickel Company is also a large producer of copper, largely exported to the United Kingdom, cobalt, selenium, tellurium, gold, silver, and platinum metals.

New Corporation To Sell Polishing and Buffing Equipment. The formation of W. J. Holtmeier, Inc., as a company for the sale of polishing and buffing equipment has been announced by W. J. Holtmeier, President. The corporation, which has offices located at 71 W. 23rd Street, New York 10, N. Y., will offer machines for grinding, polishing, buffing and abrasive belt work. Types of machines will include semi-automatics, buffers, rotary automatics and straitline buffers as well as a complete line of buffing lathes, composition feeders and accessories.

Until recently Mr. Holtmeier was the Eastern Manager for Hammond Machinery Builders, Inc., and is well known throughout the metal finishing industry because of his twenty-eight years of experience in this field.

Optimus Equipment Company, Matawan, N. J., manufacturers of metal parts vapor degreasers, washing and drying equipment, announces the joining of that company and the Midwestern Manufacturing Co., of New York, N. Y., degreaser manufacturers.

The Midwestern line of vapor degreasers and degreasing solvents will be continued, supplementing the present line of Optimus products. The company will continue under the name, Optimus Equipment Company, with headquarters and factory at Matawan.

The officers of the new company are: V. W. Todd, chairman of board, M. Jaffa, president; A. T. Baldwin, vice-president; E. N. Close, secretary and treasurer.

You Can Polish Faster and Better with ALUNDUM ABRASIVE

BECAUSE Alundum Abrasive for polishing is carefully prepared for just that purpose. At the Norton electric furnace plant it is given the correct physical and chemical properties. Then at the Norton Worcester plant, it is crushed to the right grain sizes for polishing work and is given special surface treatments which make the grains "friendly" to adhesives. They stay on the wheel head 'til the job is done!

For helpful polishing information and full details on cost-cutting Alundum Abrasive, write for a free copy of the new booklet "Setting-up Metal Polishing Wheels and Belts."

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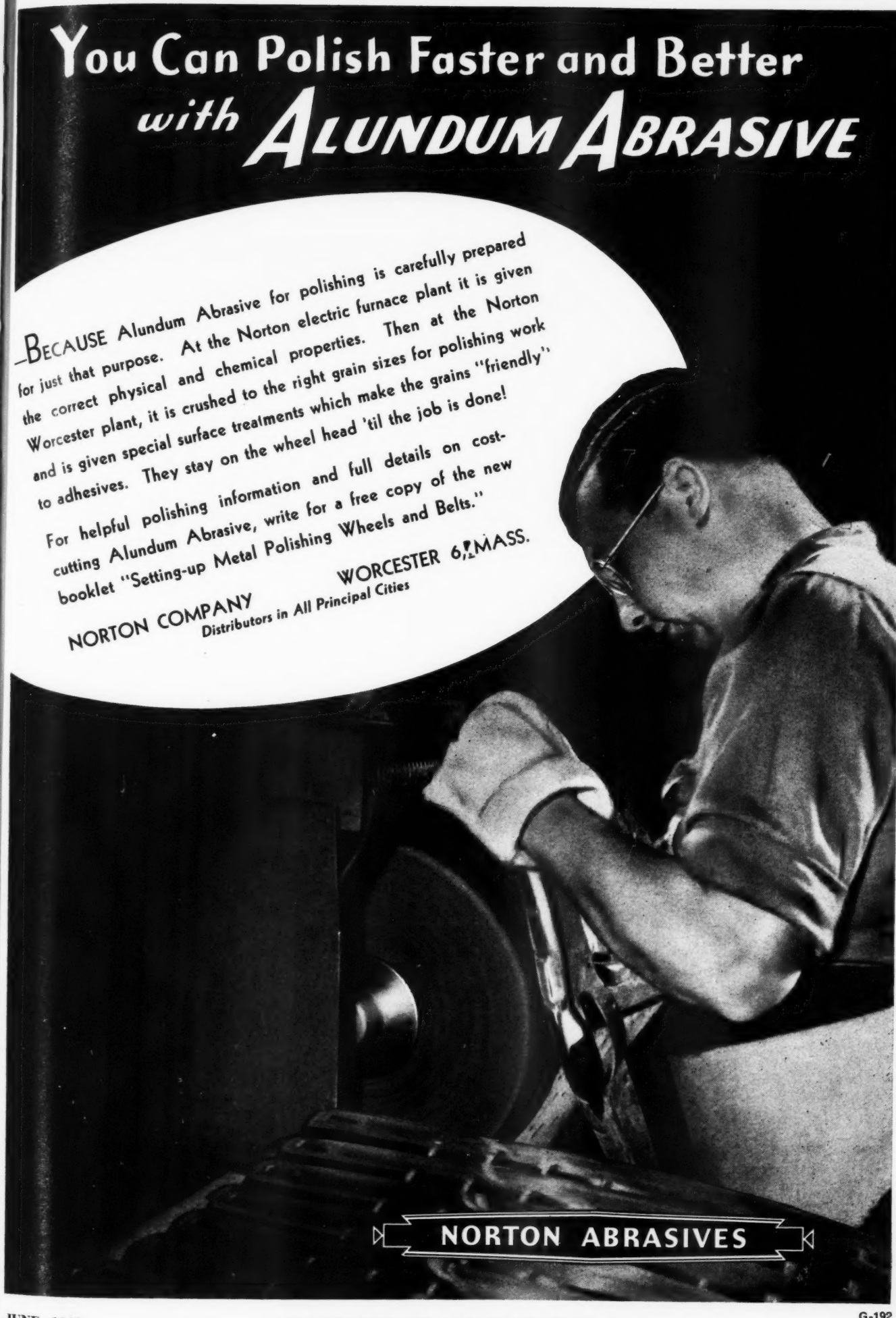
Distributors in All Principal Cities



NORTON ABRASIVES

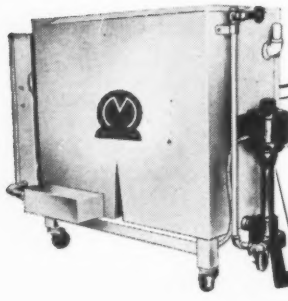
Announcing... the joining of

MIDWESTERN MFG. CO., INC.

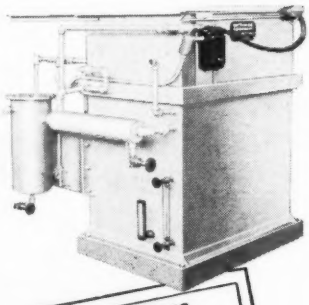
with the

OPTIMUS EQUIPMENT COMPANY

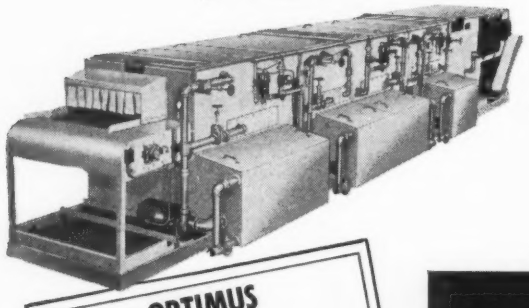
The MIDWESTERN line of Vapor Degreasers and Degreasing Solvents will be continued supplementing the present line of Optimus products.



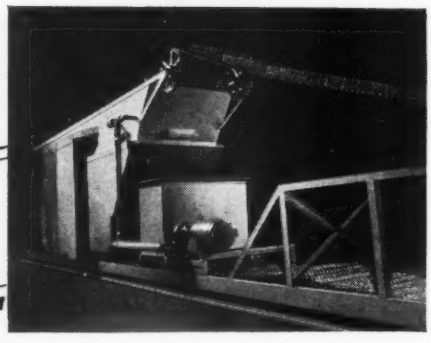
MIDWESTERN Portable Vapor Degreaser



OPTIMUS Vapor Spray Degreaser



OPTIMUS Multi-Stage Spray Washing Machine



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Standard and Special Types of equipment from the smallest to the largest sizes for a wide variety of metal degreasing, washing, cleaning, rinsing, pickling, drying and allied process operations.

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1775

OPTIMUS EQUIPMENT

FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

Personals

Edward J. Roehl has been appointed Manager of Technical Development of The Thomas Steel Company. For the past eleven years he has engaged in research and development work with The International Nickel Company and was an officer and active member of Monmouth County Section of the American Chemical Society. In addition he is active in committee work with American Society for Testing Materials and a member of American Chemical Society, Electrochemical Society, Electrodepositors' Technical Society and American Electroplaters' Society. He is the author of a number of technical papers on electroplating and has been a speaker before a number of local section meetings.

In 1942 Roehl was joint recipient with W. A. Wesley of the American Electroplaters' Society prize. He received his B.S. degree in chemistry in 1928 and his M.S. degree in chemistry in 1929, both from Cornell University, then majored in physical chemistry under W. D. Bancroft with thesis work in electrochemistry. He undertook additional graduate work at Columbia University, did research work at New York University and performed physical-chemical research in the chemical field before starting metal finishing, electroplating and corrosion work with The International Nickel Company in 1937.

Todd

Van Winkle Todd, who previously served as President, was appointed Chairman of the Board of Directors of Hanson-Van Winkle-Munning Company, Matawan, N. J., at its Annual Directors Meeting on April 15. He became associated with the company in 1912 and was its President at the time of its consolidation with A. P. Munning & Company in 1927 to form the Hanson-Van Winkle-Munning Company, of which he has served as President since that time. He will continue to maintain an active participation in the affairs of the Company and will be assisted by **Guerin Todd,** former Vice-President, who was appointed Vice-Chairman of the Board.

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Remove Organic Impurities with DARCO

Your finished work will be uniformly bright if you stay a long jump ahead and keep your solutions free of colloids and organic matter with DARCO*.

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Write for a sample or order a supply from your jobber today.

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60 East 42nd Street, New York 17, N. Y.

J. F. Herr has been appointed Vice-President of National Rack Company of Fair Lawn, N. J.

Mr. Herr, who came from the Standard Plating Rack Company of Chicago, Ill., where he served as Eastern Division Manager, was previously connected with Chrysler Corporation in Chicago, Ill., as metal finishing supervisor and with Wright Aeronautical Corporation, of Woodridge, N. J., in the same capacity. He brings to National Rack Company the experience of actual plating rack usage in the field, as well as the manufacture and sales of racks.

Roland F. Boehm succeeds W. S. Hammond, recently deceased, as District Sales Manager of the Houston Sales District of Mathieson Chemical Corporation (formerly The Mathieson Alkali Works). During World War II, he served with the War Production Board as Assistant Chief of the Nitrogen Unit, Chemical Division, Washington, D. C. He has been with Mathieson since January, 1946. His headquarters are in the Second National Bank Building, Houston, Texas.

William Di Leo has recently been appointed to the plastics section of the laboratories of Lupomatic Industries, Inc., 4501 Bullard Avenue, New York 66, N. Y. He is to exploit the many Lupomatic improved processes for tumbling plastic parts to a high, lustrous finish.

Mr. Di Leo has had many years of experience with plastic manufacturers and fabricators in creating more effective combinations of compounds and carriers to insure quality control of finishing operations through tumbling.

Hague

Louis M. Hague, former Vice-President, has been appointed President of the Hanson-Van Winkle-Munning Company, Matawan, N. J. Born in Pittsburgh, where both his grandfather and his father operated electroplating plants, he has spent most of his life in the electroplating industry. He joined the staff of the Hanson-Van Winkle-Munning Company in 1928, has served successively in various sales and service capacities, and since 1939 has been a Director and Vice-President in charge of sales. These duties were taken over by **John H. Bauer,** who has served as sales manager.

Gray

Van M. Gray has recently been appointed St. Louis, Southern Illinois and Minneapolis sales representative of the American Buff Company, Chicago, Ill. He will handle the complete line of American Buffs and Polishing Wheels, rendering full sales-engineering service.

Mr. Gray brings to his new position a solid background of business experience over a period of seventeen years. During eight of these years he was a successful sales executive. A Philadelphian by birth, Mr. Gray spent his college years at Georgia Tech. He now lives in Chicago with his family.

†**Charles S. Taylor,** honorary member of the American Electroplaters' Society from the Boston Branch, died on April 29 in his 92nd year, after a six months' illness resulting from a fall and a broken hip. The services were held on May 1, 1948.

Mr. Taylor was elected honorary member of the Society at its Annual Convention in Asbury Park, in 1939. His passing will be mourned by many friends.

CHROMIUM CHEMICALS

FOR THE ELECTROPLATER

MUTUAL CHEMICAL CO. NEW YORK

OVER A CENTURY OF CHROMIUM CHEMICAL PROGRESS

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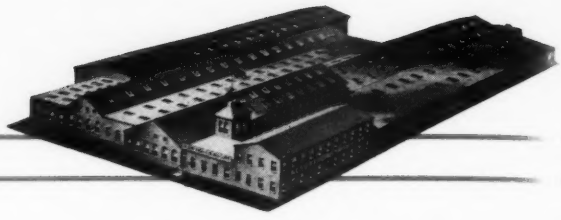

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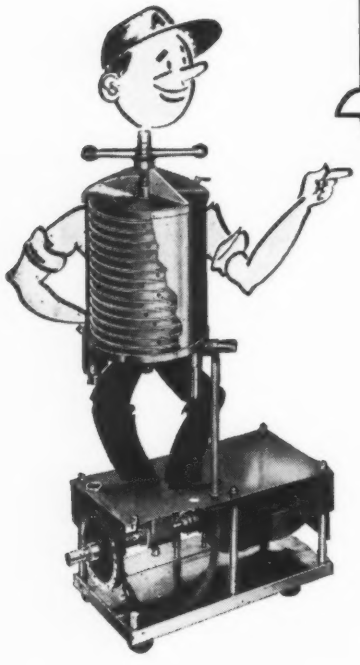

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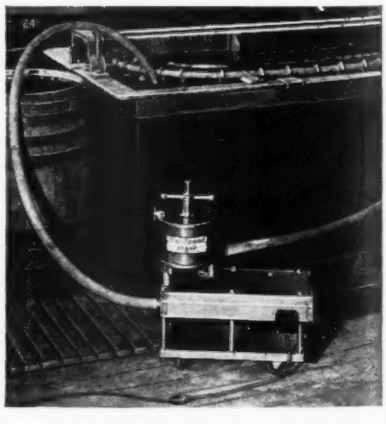

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DEPT. B

Editorial

June 1948

CONVENTION BUSINESS

LIKE SUCCESSFUL BUSINESSES, technical societies start small and grow big as they prove their value. And as they grow big, they become businesses. Their officers take on the responsibilities of management, and the membership or its representatives at annual meetings check up on their performance.

The American Electroplaters' Society, which celebrates its 35th birthday the end of this month, has only entered the ranks of big societies during the last few years. An examination of its "profit-and-loss" statements shows that the totals reached the $100,000.00 mark only in 1945. This year's income and outgo in the several funds balance at close to $125,000.00, of which more than $25,000.00 was expended for plating research for the benefit of the members and industry as a whole and largely paid for by industry.

The Convention has before it a serious responsibility. Foremost among its tasks is to supply a constitution and by-laws better adapted to the Society's needs as an expanding organization. Second, it has to consider improvements in its educational activities in view of the increasingly larger fund of knowledge which must be made available to the members. Third, it must elect new officers who not only command the support of the members and possess the necessary business experience, but who also can spare the considerable amount of time which a good officer must devote to Board meetings, Branch meetings, correspondence and routine functions of his office.

All members who have the good of the Society at heart look forward to the actions of the Convention with much expectation.

Gustaf Soderberg

SOME METALLURGICAL ASPECTS OF ELECTRODEPOSITS

CARL E. HEUSNER
A. R. BALDEN
L. M. MORSE

Materials Testing Laboratory
Engineering Division

Chrysler Corporation
Detroit, Michigan

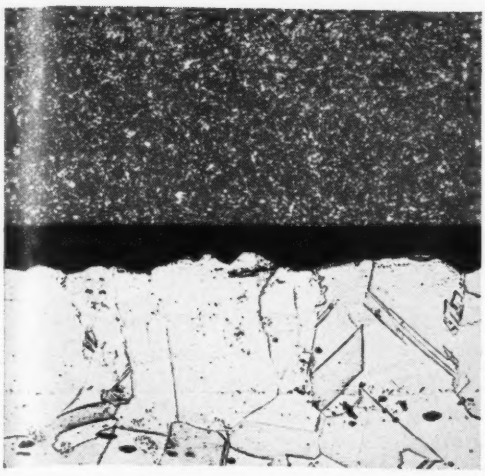
Introduction and History

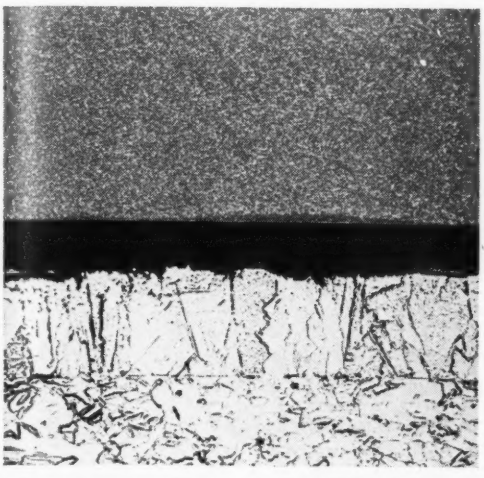
Electroplating has often been referred to as a very old art and a very new science. The early uses of electrodeposited coatings were mainly decorative, and the expected service life was extremely short. As more experience was gained, the quality of the deposits was gradually improved, and as early as World War I electrodeposition was used to a limited extent as a salvaging operation. This background of experience and the difficulties connected therewith focused the attention of many platers on the serious absence of data concerning nickel solutions. The advent of commercial chromium plating in 1927 placed a new emphasis on the physical qualities and adhesion of copper and copper-nickel deposits. The unsatisfactory degree of adhesion which had been commonly accepted was not sufficient to withstand the stresses caused by chromium plating. Difficulties arising from the application of this process stimulated some basic work on the structure, purity and properties of electrodeposits. This was probably the first notable instance in which a concerted scientific attack had been made on the many problems in electroplating.

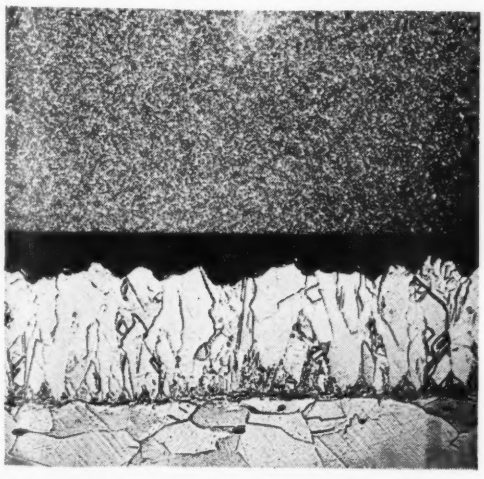
Macnaughtan and co-workers[1,2] in England did considerable pioneering on the possible effect of solution composition on the physical properties of electrodeposited nickel and on the tendency of these solutions to produce pitted deposits. Hothersall[3] showed that in order to obtain ductile, soft deposits of copper from an acid sulfate bath, the solution must be free of organic contaminants. Madsen[4] described a method of producing electrodeposited nickel of high ductility by using a solution free from organic and inorganic impurities.

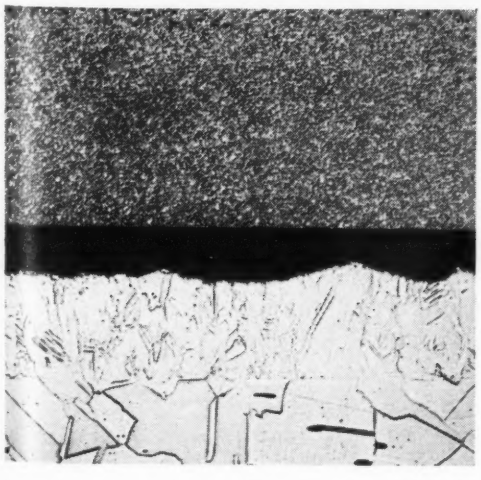
Among other notable contributions by Hothersall to the science of electroplating was a study[5] of the fundamental nature of adhesion. He indicated several factors which could cause poorly adherent deposits, among them thin films of oxides or organic substances and weak structure of the initial deposit or of the surface of the base metal. Many published articles have appeared in the twenty years that have passed since that time, and much fundamental knowledge of the science of electroplating may be expected from the successful completion of the several research projects now being sponsored by the American Electroplaters' Society.

Just as there are metallographic structures which are typical of cast metals, hot-rolled metals and cold-rolled metals, there is one structure which we may say is typical of electrodeposited metals, the columnar grain structure. There are many variants of this structure, such as the "needle-like", "conical", "submicroscopic-grain" and "laminated" structures, which are closely related to the columnar structure in that the long axes of the grains have a more or less pro-









All figures: Top: normal view, 10 X; bottom: cross section, 500 X. About one-half size

Read left column, top to bottom:

Fig. 1. Copper deposit from copper sulfate-sulfuric acid bath without addition agent on etched annealed copper

Fig. 2. Copper deposit from copper sulfate-sulfuric acid bath without addition agent on etched hard-rolled copper

Fig. 3. Copper deposit from copper sulfate-sulfuric acid bath without addition agent on buffed annealed copper, degreased in alkali solution and given a short dip in sulfuric acid solutions

Fig. 4. Copper deposit from copper sulfate-sulfuric acid bath containing molasses on etched annealed copper

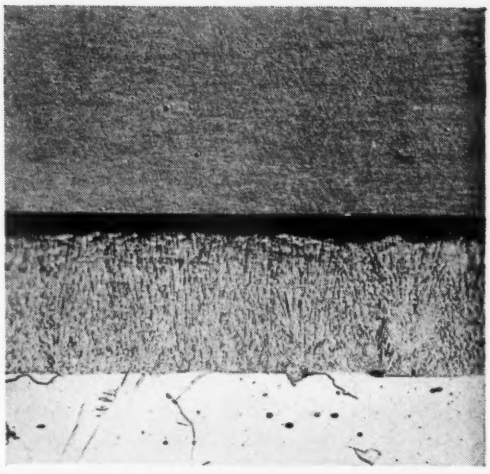
Read right column, top to bottom:

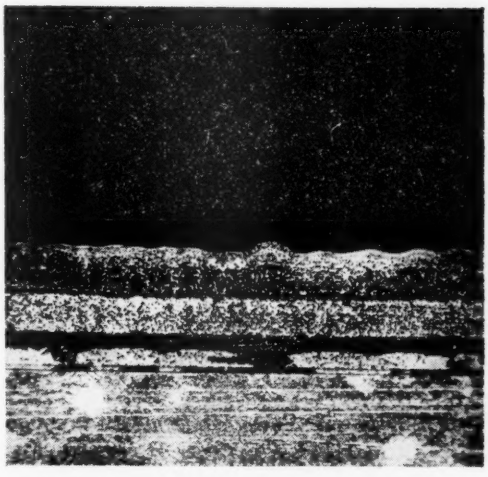
Fig. 5. Copper deposit from cyanide copper bath containing rochelle salt on etched annealed copper

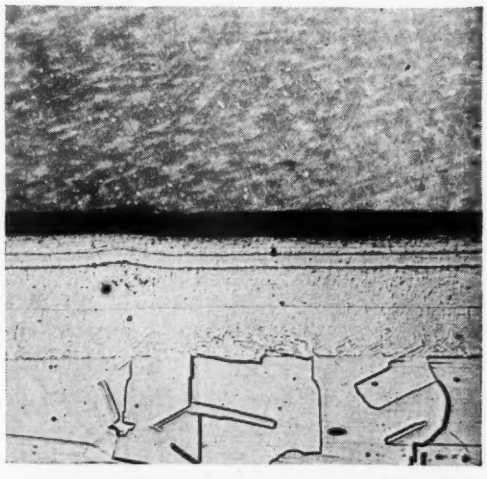
Fig. 6. Copper deposit from copper cyanide bath containing brighteners on copper

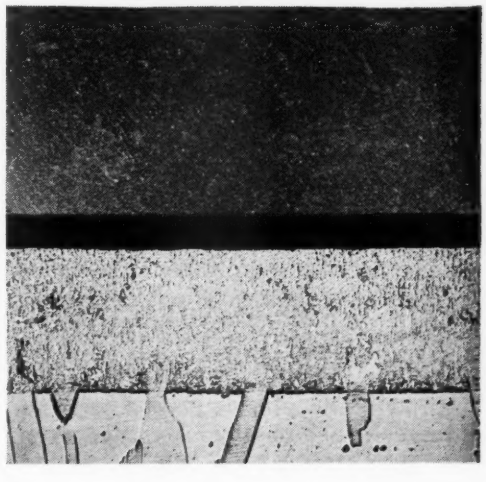
Fig. 7. Copper deposit from copper sulfate-sulfuric acid bath containing molasses and thiourea on etched annealed copper

Fig. 8. Copper deposit from copper pyrophosphate-potassium pyrophosphate-ammonia bath on etched annealed copper









nounced tendency to be perpendicular to the base metal surface. Their formation may be compared to the development of grains in a solidifying melt in which the direction of growth is normal to the surface of the cooler mold.

Figs. 1 to 13 inclusive show some of the more common grain structures encountered in the metallography of electrodeposits. The first series, Figs. 1 to 8, consists of structures of copper.

The basic structure, known as columnar, is shown in Figs. 1 and 2. Coarse-grained columnar deposits such as these are usually obtained from simple solutions of highly ionizable metal salts, such as sulfates, chlorides and fluoborates. The lower rates of deposition and higher temperatures favor the larger grain size.

The deposits in Figs. 1 to 3 were produced from a simple solution of copper sulfate and sulfuric acid and are about 0.002–0.003 inch in thickness. The irregular surface in Fig. 1, due to the varying slants on the terminal faces of the different grains, apparently results in the coarse matte appearance of this deposit. It is interesting to note that the grain orientation of the base metal, which is annealed copper, appears to be continued in the grains of the deposited metal. The direction of growth, however, is perpendicular to the base metal surface. The coarse grained base metal is in part responsible for the coarse deposit.

Fig. 2 shows an acid copper deposit on a piece of cold drawn copper. Although the bath conditions were exactly the same as in Fig. 1, the grain size is smaller because the base metal grain size was smaller.

The next illustration, Fig. 3, shows the same type of deposit on a base of annealed and buffed copper. Note that the grain size is considerably finer, especially near the base metal. This is a type of conical structure. The explanation for this appearance is that the buffing leaves a surface layer of amorphous metal (sometimes known as the Bielby layer). The cleaning treatment used in the preparation of this specimen was insufficient to remove the amorphous metal and expose the true grain structure of the annealed base metal. Since the plated layer tends to continue the underlying structure, the first metal deposited is disorganized and fine grained. (The base metal of Fig. 1 was also buffed but received a more drastic cleaning treatment including anodic etching in sulfuric acid which served to remove the strained and distorted metal of the so-called Bielby layer and expose the true grain structure of the annealed copper.)

Fig. 4 shows a deposit from the same bath with an addition of molasses to refine the grain. Note that the deposit starts to carry through the structure of the base metal but that the grains are finer and more disorganized. The molasses in this case apparently interferes with the normal growth and enlargement of grains.

The addition to a plating solution of colloidal materials or soluble organic materials of high molecular weight almost invariably affects the grain size. Such practice has been common in the plating art for many years.

Another factor influencing grain size is the metal ion concentration. When the metal to be plated is present in the solution as part of a radical or a complex ion, the actual metal ion concentration can be extremely small, a fine structure is produced without addition agents, and an even finer one is produced when proper additives are used.

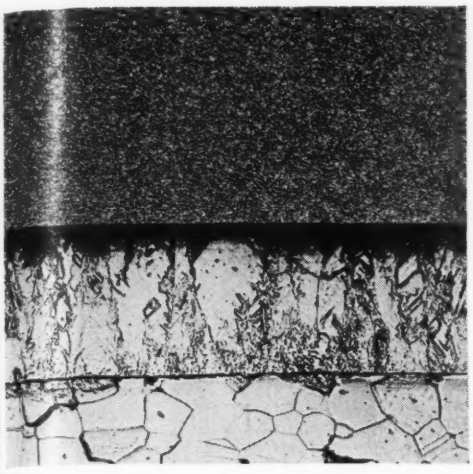
An example of this is the cyanide copper bath, in which the copper is mainly present in the cuprocyanide ion. The inherent structure of this deposit is fine and columnar, as shown in Fig. 5, but the grain diameters are so small that the deposit is sensitive to the presence of inclusions. Wherever an inclusion exists, the grains tend to grow radially from this inclusion with the result that a structure commonly known as a nodule is formed. Sections through several such structures can be seen in the photomicrograph, and the familiar nodules are seen in the normal view of the surface. This deposit is about 0.003 inch thick.

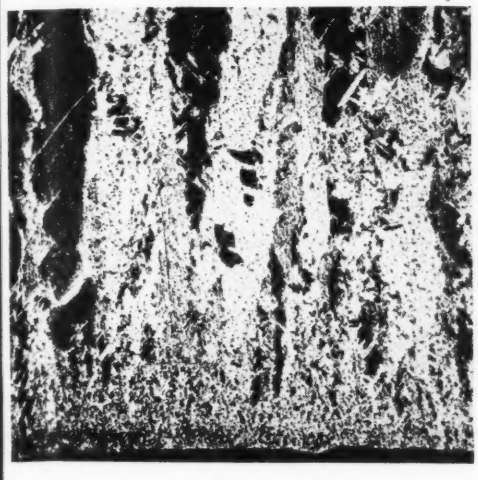
A typical deposit from a bright cyanide copper bath is shown in Fig. 6. This bath not only contains its copper in the complex ion, but an addition agent is also used. The individual grains are too fine to be resolved by the microscope, but the nodular structures are plainly shown in this 0.002 inch thick deposit. The nodules appear to start close to the base metal. Considerable lamination is also visible. There have been many explanations of laminations, which are a common characteristic of many bright or semi-bright deposits. Some of these explanations will be discussed later. One may say that this deposit has a submicroscopic grain size and a laminated, nodular structure.

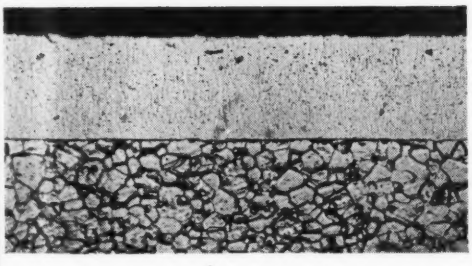
Fig. 7 shows another deposit of sub-microscopic grain size, this one from the acid copper sulfate bath containing molasses and thiourea. Sulfur-containing compounds such as thiosulfate, carbon disulfide, thiocyanate and thiocarbamates seem to produce brightness in copper and silver baths, possibly because of formation in the cathode film of colloidal sulfur compounds which interfere with grain growth.

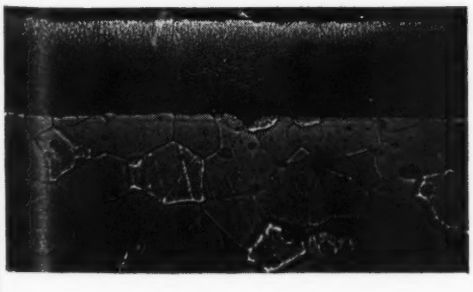
Fig. 8 shows a deposit from a copper pyrophosphate bath containing also potassium pyrophosphate and ammonium hydroxide. The deposit is bright although there were no organic addition agents in the bath. Copper is apparently present in the bath as a slightly dissociated copper pyrophosphate ion, $Cu(P_2O_7)_2$,[6] and the copper ion concentration is nearly as low as in a cyanide bath.

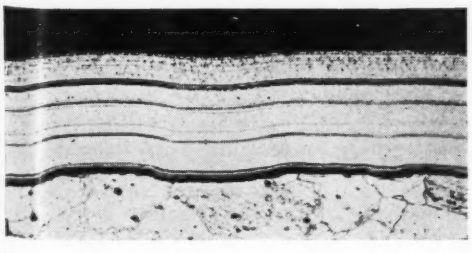
The next series of illustrations, Figs. 9 to 13, show nickel deposits. The first photograph in Fig. 9 shows the conical grain structure of nickel plate from a Watts bath. The so-called conical structure is merely a variant of the columnar structure in which there is a marked tendency for some of the grains to grow larger in diameter as they grow outward from the base metal. This occurs at the expense of other grains











which are crowded into the spaces between the favored grains and finally cease growing. Fig. 10 shows the same effect in a non-adherent Watts type nickel deposit stripped from a stainless steel cathode.

The grain outlines of nickel deposits are much more difficult to resolve under the microscope than those of copper. In some cases, pseudo structures such as nodules are mistaken for grains.

Fig. 11 shows a deposit from a Watts type nickel bath of a high *p*H. The structure of this 0.002 inch thick deposit is fine and columnar. Photomicrographs in the recent article by E. J. Roehl[7] show that deposits made under similar conditions become large-grained when the thickness is upwards of 0.010 inch.

The deposit in Fig. 12 is semi-bright cobalt-nickel. The additions used have produced a grain refining effect. Microscopic studies of such deposits indicate that the average grain size is of the order of 0.1 microns. Whether or not actual grains are visible is debatable.

In Fig. 13 is seen a bright nickel deposit produced in a nickel bath containing organic addition agents. The grain structure is again too fine to resolve microscopically.

Laminated Depostis.—The laminated or banded structures seen in some of the figures are often associated with extremely fine-grained bright deposits and almost always in the presence of an addition agent in the bath. It is believed that, in the process of deposition, concentrations of the foreign products build up in the film of electrolyte next to the cathode, causing polarization to rise. When the voltage rises high enough to discharge the foreign ions or micelles, they become part of the deposit, forming a layer which is often visible on metallographic examination. An inherent shortcoming of this type of structure is that often the layers of foreign material are weak and thus make possible separation of one or more layers of the nickel deposit.

Another cause of lamination is presence of materials in the bath which deposit at a lower voltage than the primary metal. An example of this is copper in a nickel bath. Momentary variations in the cathode voltage due to poor or interrupted contact, or changes in agitation, for example on a conveyor plating machine, will cause preferential deposition of copper, again giving planes of weakness in the deposit. Such laminations are plainly visible under the microscope.

Nodular Deposits.—Figs. 14 and 15 show typical nodular deposits produced in a high-speed cyanide copper bath and in a high chloride

Read top to bottom:

Fig. 9. Nickel deposit from Watts type bath at pH 2, 120° F, 40 asf on cold rolled steel. Top: normal view, 10 X; bottom: cross section, 500 X, about one-half size

Fig. 10. Cross section of thicker deposit produced under the same conditions as in Fig. 9 on stainless steel and then peeled. 500 X, about one-half size

Fig. 11. Cross section of nickel deposit from Watts type bath at pH 4.75, 120° F, 40 asf on cold rolled steel. about 500 X, one-half size

Fig. 12. Cross section of semi-bright cobalt-nickel deposit from Watts type nickel bath containing 0.46 oz/gal cobalt sulfate, 0.33 fl.oz/gal formalin and 3.0 fl.oz/gal formic acid at pH 3.7, 170° F, 40 asf. 500 X, about one-half size

Fig. 13. Cross section of typical bright nickel deposit from Watts type bath containing organic addition agents, including a naphthalene sulfonate, a wetting agent and others. 500 X, about one-half size

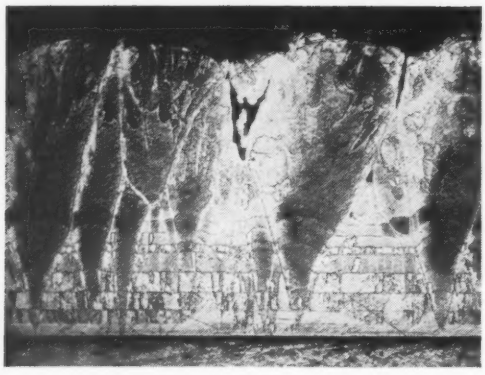


Fig. 14. Cross section of thick nodular copper deposit from copper cyanide bath containing brightener. 100 X, about one-half size

nickel bath. Both are much above the thickness for which the baths were intended. It is possible to produce nodular deposits in any bath, but there seem to be certain conditions which are conducive to extreme nodulation, the most common of which is the presence of finely divided or colloidal particles in the bath.

A nodule may apparently originate from any nucleus which is of sufficient size to interrupt the normal growth of a grain. Grain growth then begins to radiate from this nucleus and a conical grouping of grains with a rounded top occurs. It is possible to produce nodules in a coarse grained acid copper deposit as well, but it usually reaches a much greater thickness before the nodules are objectionable. Also, it will take a larger inclusion to act as a nucleus in a coarse grained deposit. This may be the reason that it is so much easier to produce smooth heavy deposits in an acid bath than in a cyanide copper bath.

Porosity.—As would be expected from the mechanism of growth of electrodeposits, wherein many crystal structures are simultaneously growing adjacent one to another, there is considerable opportunity for the formation of voids or fissures in the structure. This can be particularly true where two or more crystalline grains interfere with each other. It may be stated, with reasonable certainty, that all electrodeposits are porous in some degree. As deposits become thicker, the length of the pores becomes greater in proportion to their width or diameter and a greater length of time is required for chemical reagents or ordinary atmospheric corrosive elements to reach the base metal at the bottom of these pores. There have been many reports that porosity disappears in most electrodeposits between 0.001 and 0.002 inch, but we believe that this only means that the tests used did not permit the reagent to penetrate the devious capillary passages to the base metal. The more commonly recognized pores can be caused by inclusion in the deposit of suspended matter from the solution or by the condition of base metal surface, such as the presence of slag inclusions, oxide particles, or pores. Gas bubbles remaining attached to the surface of the cathode during the entire period of deposition are the cause of a special type of porosity known as gas pitting.

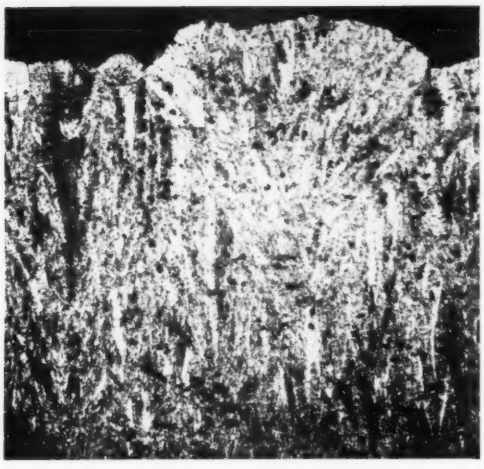


Fig. 15. Cross section of thick nodular nickel deposit from impure Watts type bath of high chloride content. 250 X, about one-half size

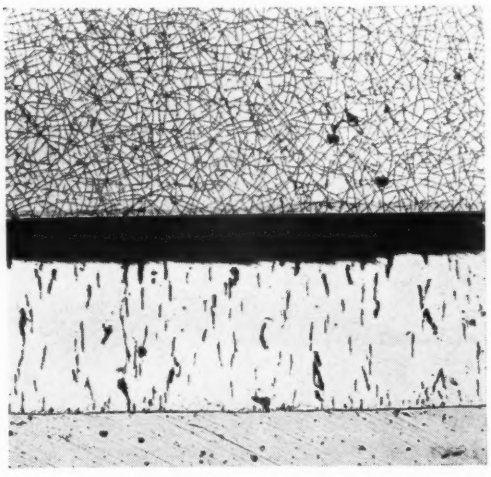


Fig. 16. Hard chromium deposit, etched to show crack pattern. Top: normal view, 100 X; bottom: cross section, 500 X. About one-half size

The latter types of porosity may be recognized under the microscope if the investigator has enough patience to repolish the specimen until the pore is intercepted by the plane of the section. Inherent porosity is seldom observed microscopically, although large voids are sometimes observed in spongy, nodular or "burnt" deposits. An example of this is seen in Fig. 14.

Another type of porosity which can be important is inherent cracking of the deposit. Chromium is one good example of this, another is the sealed anodized coating on aluminum. In chromium plating the deposit is under considerable internal stress; apparently the stress is relieved periodically during plating by the formation of shrinkage cracks. The typical appearance under a microscope of the surface of a heavy chromium deposit resembles a mud flat baked in the sun (Fig. 16, top). J. B. Cohen[8] has shown that the cracks contain chromic oxide apparently originating from the cathode film being drawn into the voids when the cracking occurs. A section of chromium deposit also shows the fissures or inclusions (Fig. 16, bottom).

TABLE I. MECHANICAL PROPERTIES OF SOME NICKEL DEPOSITS

Type of Solution	Tensile Strength psi	Elongation % in 2 inch	Hardness VHN
Watts (40–6–5), *p*H 2.0	54,500	22.5	113
Watts (40–6–5), *p*H 4.75	87,800	4.0	329
All sulfate, *p*H 2.0	89,000	12.5	205
High chloride (40–12–5), *p*H 2.0			
40 asf	63,000	22.5	187
20 asf	58,900	22.2	141
60 asf	61,000	19.5	180
A semi-bright cobalt-nickel	209,600	3.5	416
An organic bright nickel	216,400	2.0	470

TABLE II. MECHANICAL PROPERTIES OF ACID COPPER DEPOSITS

Addition Agent	Tensile Strength psi	Elongation % in 2 inch	Hardness VHN
None	36,150	22	81
Molasses	33,000	21	81
Molasses and thiourea	80,280	3	170

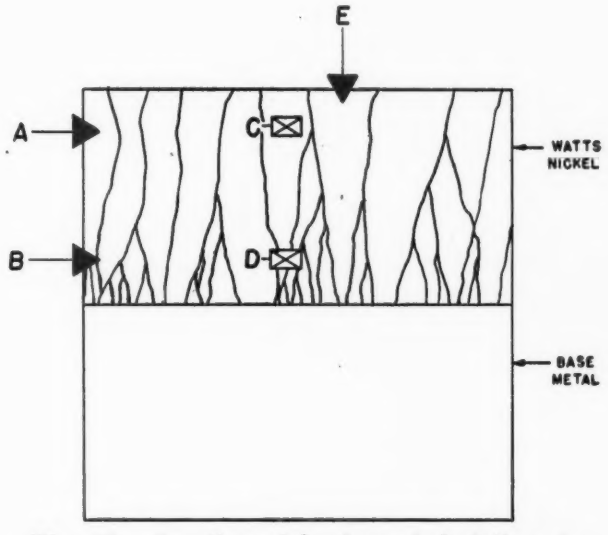


Fig. 17. Location of hardness indentations in conical deposit of Watts nickel

Mechanical Properties

Hardness.—As would be expected from experience with other forms of metals, the hardness of electrodeposits is, in general, related to the grain size. Thus for any particular pure metal electrodeposit, the finer the grain size the greater is the hardness. The tensile strength of deposits increases with the hardness in most cases. Measurements made of the tensile properties and hardness of some of the deposits of the preceding figures are given in Tables I and II. The fine grained deposit of bright acid copper is considerably harder than the other acid copper deposits and has a tendency to be brittle. Brittleness is often associated with bright fine grained deposits, but not always.

Another factor which may affect the hardness of an electrodeposit is the amount of included or occluded material. As an example—dull nickel plated from a nickel sulfate-nickel chloride-boric acid bath may be quite soft with a bath *p*H of 1.5 and relatively hard with a *p*H of 5.3 The difference has been shown to be due to nickel hydroxide being occluded in the latter deposit, probably causing slip interference[6]. The use of organic, colloidal, or alloy addition agents also increase the hardness for one or both of these reasons.

Pure chromium in the annealed condition has a hardness of around 200 Vickers, but chromium plate deposited from solutions of chromic acid has a hardness in the range of 400 to 1000 Vickers. Electrodeposited chromium is not only extremely fine grained but has been shown to contain a considerable proportion of chromium oxide.

It should be pointed out that hardness measurements of electrodeposits may be made in two major directions, either normal or parallel to the base metal surface. The apparent hardness of the deposit will vary depending upon the direction and location of the indentation. As would be expected, precautions must be taken to avoid the effect of the base metal. Data contained in this report were taken with a Tukon Hardness Tester using a Vickers Diamond Pyramid. In measuring hardness normal to the base metal the rule was followed that the thickness of the deposit must be at least ten times the depth of the penetration.

Fig. 17 represents a heavy deposit being hardness tested at several points. The readings at B and D will in general be the higher because the grain size is finer at this level. This variation is also observed with tensile strength, ductility and stress as well as with porosity[7]. For these reasons, there may be in the

TABLE III. HARDNESS OF ELECTRODEPOSITED METALS*

Metal	Solution	Brinell Hardness		
		As Plated	Fully Annealed	Work Hardened
Chromium	Chromic acid	400–950	70	...
Platinum	.....	606–642	47	97
Rhodium	.....	594–641	101	...
Palladium	.....	190–420	49	109
Cobalt	Sulfates with other salts	164–380	86	...
Nickel	Sulfate	125–420	70	300
Nickel	Sulfate with colloids	Up to 550	70	300
Iron	Sulfate-chloride	140–350	69	148
Copper	Sulfate with colloids	40–130	40	102
Copper	Cyanide	130–160	40	102
Silver	Cyanide	60–79	25	68
Cadmium	Cyanide	12–22	..	..
Cadmium	Cyanide with colloids	53	20	34
Zinc	Sulfate	40–50	33–40	54
Tin	Stannate	8–9	4–5	..
Lead	.....	3–5	...	..

*Trans. Faraday Soc. 31, 1168 (1935); J. Electrode-positors' Tech. Soc. 9-10, 77–183 (1934).

literature a number of conflicting values for the electrodeposits of the common metals. In Table III are shown some values which are frequently referred to in connection with mechanical applications of plated metals. It should be pointed out that a considerable range of properties may be obtained from a given bath by variations in the conditions of deposition.

Tensile Strength.—Tensile strength of deposited metals varies considerably with the structure. As one would expect, the tensile strength is almost always taken in a direction parallel with the base metal. Judging from the foregoing photomicrographs, this might be said to be the equivalent of measuring the tensile strength of sheet stock across the grain instead of parallel to the grain. Since the direction of pull is such as to separate the grains rather than to deform them, the interatomic forces between grains become very important. If there is any foreign material in the grain boundaries, there may be a considerable decrease in tensile strength and especially in elongation.

Our usual method for measuring tensile strength consists of depositing about 0.020 inch of the metal on a sheet of polished stainless steel. The plated layer is then easily stripped off the sheet and cut into 1-inch wide strips which are clamped between steel plates and cut to standard test bar size in a milling machine. Tensile values are measured exactly as described in ASTM Specification B109-44T for sheet aluminum (Fig. 18). Checks on the method of preparing the specimens have been made by depositing the metal on other base metals, such as copper or steel, with good adhesion and then dissolving away the base metal.

Brittleness.—While we are greatly concerned with the relative brittleness of deposits produced under certain conditions, we do not know exactly what mechanical or physical test best indicates brittleness. We usually interpret the per cent elongation in two inches as a measure of ductility. Reduction of area is perhaps a somewhat better indication but is difficult to estimate on these specimens. As a quick shop test for brittleness, a piece of plated stock is bent slowly until the plating cracks. The actual strain at the point of cracking is approximately T/2R where T is the total

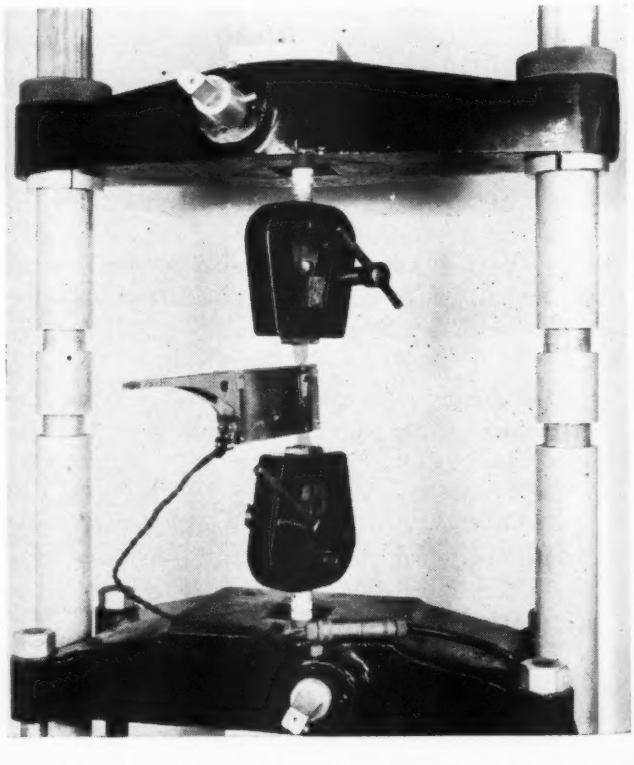


Fig. 18. Set-up for determination of tensile strength and elongation of electrodeposits

TABLE IV. EFFECT OF ADDITION AGENTS ON STRESS, DUCTILITY, AND BRIGHTNESS OF BRIGHT NICKEL "A"

No.	Additions	Stress 1000 psi	Ductility of Stripped Coating						Appearance of Bent Cathode
			Interface Concave			Interface Convex			
			2R in.	T inch	T/2R	2R in.	T inch	T/2R	
1	None—inorganic components only	22.1	0.002	0.001	0.5	0.002	0.001	0.5	Dull grey deposit
2	No. 1 plus recommended concentration of secondary brightener	−6.5	0.002	0.001	0.5	0.002	0.001	0.5	Semi-bright deposit
3	No. 2 plus recommended concentration of wetting agent	−6.8	0.002	0.001	0.5	0.002	0.001	0.5	Semi-bright deposit
4	No. 3 plus ¼ recommended concentration of primary brightener	−10.5	0.002	0.001	0.5	0.002	0.001	0.5	Bright deposit with some cloudiness; uniform brightness in recessed area
5	No. 3 plus ½ recommended concentration of primary brightener	−9.8	0.002	0.001	0.5	0.002	0.001	0.5	Bright deposit; some stains ½ inch from apex of 45° angle
6	No. 3 plus recommended concentration of primary brightener	0.7	0.008	0.00075	0.093	0.038	0.00075	0.019	Bright deposit; some dark stains ½ inch from apex of 45° angle
7	No. 3 plus twice recommended concentration of primary brightener	15.3	0.019	0.001	0.052	0.060	0.001	0.016	Bright deposit; dullness ¾ inch from apex of 45° angle as well as ¼ inch from apex of 90° angle
8	No. 7 but twice recommended concentration of wetting agent	18.0	0.018	0.001	0.055	0.032	0.001	0.030	Same as No. 7

thickness of base metal and plate and R is the radius of curvature of the bend. This formula is nearly exact if the strain in the base metal is all elastic. Thus, if a flat piece of 1/8 inch steel with 0.001 inch nickel plate is bent and the nickel cracks when the radius of curvature is 3 inches, the strain to produce cracking is 0.0125 / 2x3 = 0.0208 inch per inch or 2.08 per cent.

Another way of applying the same test is to plate non-adherently on stainless steel and place the peeled plate between the jaws of a micrometer (Fig. 19). The micrometer is closed until the plating snaps in two. The reading at this point is very roughly equal to 2R. The plate thickness T divided by the 2R gives the strain value as before. There is one factor of uncertainty in this form of the test in that the nonadherent plate may have different ductility than a strongly adherent deposit out of the same bath. It is conceivable that such a difference could exist due to the effect of the base metal on the deposit structure. To sidestep this difficulty it has been suggested that strips of a suitable base metal, such as 0.020 inch thick shim stock, be plated with good adhesion and rolled up on a conical mandrel such as used in the testing of paint adhesion.

It should be pointed out that the value of elongation given by these tests includes strain both below and beyond the elastic limit. A brittle deposit of nickel might give a value of 1.0 per cent elongation, but after subtracting the elastic strain the actual

(*Continued on page 577*)

This article has been prepared in response to the appeal by Mr. Kenneth M. Huston, President of the American Electroplaters' Society, in his editorial in the August issue of The Monthly Review. We hope it will inspire other "old-timers" to set down their early experiences.

Early Plating Experiences

ERNEST LAMOUREUX

Los Angeles, California

THESE REMINISCENCES go back to the early 1880's or approximately sixty-seven years ago when plating was still rather primitive as compared with today's practices with modern equipment, chemical control methods, and plant research.

My first contact with plating came when at the tender age of nine I started to work for W. C. Davis Stove Company in Cincinnati, Ohio. This company later became known as the Favorite Stove and Range Company and still later moved to Piqua, Ohio.

Cleaning and Plating

In those early days we used rolled nickel anodes and, of course, double nickel salt baths. It was over twenty years later that I first encountered cast nickel anodes. They were introduced by Mr. Levett of Zuker, Levett & Loeb Company to his trade while I was working with that company*.

When I started to work, all work was hung on copper wires. Later, racks were developed for some of the parts.

We used two Weston generators, or dynamos as they were known then. The field windings were over hollow copper tubes through which water was circulated in order to keep the machines cool†. The commutators were copper plates fastened with screws and separated with isinglass. They were renewed as they wore down. Leaf copper brushes were used.

These dynamos were susceptible to reversal on starting. Each time that we began operations after the power had been shut off with work in the tank, we had to watch the work; if the current had reversed its direction, we simply interchanged the conducting wires where they were connected at the tanks.

At first there were no rheostats to control the current. Our initial attempt in that direction was to use a loop of steel wire on the side of the tank. The current was adjusted by moving a cross bar up or down the loop.

The Zucker, Levett and Loeb Company panel rheostats came into use later. They consisted of wooden panels, with wires looped up and down and arranged at the bottom in a semi-circle. The current was controlled by moving a contact lever in either direction‡.

Prior to the use of dynamos, batteries were used for plating. According to Messrs. Moses Brunell and Harvey Miller, two of my supervisors in those early days, only two batches of work were turned out in 24 hours from plating tanks using batteries as a source of current.

The cleaning was done in potash solutions. The potash was received in barrels; chunks of it had to be chiseled out before it could be dissolved in water. However, our cleaning problems were easy for reasons that I will discuss later in connection with polishing.

I should make it clear here that while my superiors may have had some knowledge of the composition of the nickel bath with which we were working (and I have my doubts even about this), no one knew exactly what thickness of nickel we were depositing upon the work. Certainly neither I nor any of the help

*Cast anodes were invented and patented by Dr. Isaac Adams and used widely by his licencees beginning with the early 1870's (Editor).

†This sounds like the Little Giant manufactured by Zucker, Levett and Loeb Company. The early Weston machine exhibited at the Philadelphia Centennial Exposition in 1874 and now located in the Ford Museum in Dearborn, Mich., was not water cooled.(Ed.)

‡This type was first shown in 1883 in "A Practical Guide for the Gold and Silver Electroplater" by William H. Wahl as being used with a German plating generator. Zucker, Levett and Loeb Company described it in its catalogue of 1897 (Editor).

working with me knew what it was. Quality was a matter of time in the tank, color of the plate, and judgment.

However, I want to emphasize that we did not have any problems with corrosion or rusting. Some of the nickel plated cast iron stove parts were kept in stock bins as long as two and three years. Wintertime the plants were heated with stoves only after the men had arrived to work, and they were left to cool to outdoor temperature during nights. As a result the parts in the stock bins were subjected to daily moisture condensation. While some of the nickel plate did turn dull or assume a milky color, after buffing it became just as bright as it was originally. I will discuss the reasons for the absence of corrosion later.

Polishing and Buffing

The pattern of the ornamental stove parts manufactured at that time was square. We buffed the nickel plate with wooden wheels having a double leather covering. The first strip of leather was glued and fastened with wooden pegs. It was trimmed and trued after it had thoroughly dried. Then the second strip was glued and fastened with steel wire pegs. After thorough drying, the pegs were removed with pliers, and the wheels were trimmed and trued again. The wheels were then faced with fine flour emery and used for the final polish finish.

Some of the wheels were employed for buffing when their surface had become smooth. We generally used crocus for buffing, a material which did not cut any of the nickel off the square pattern and left a perfectly clean snow-white background.

The first cloth buffs that we used were made from squares and balanced by turning them as one can turn a deck of cards to form a circle. They were worn to an evenly round surface by the work.

I have mentioned above that the buffing composition was crocus. Rouge and some white compositions came into use in the same period. Machine oil and emery paste were used for grease wheels and finishing.

The wheels for all polishing operations were wood covered with leather. Many of the wheels were shaped to the contour of the work, the shape being formed in the wood before it was leather covered.

The grade of emery for polishing was considered unimportant, except that the first operation may require a coarse grade. However, of primary importance was that each wheel had to obliterate all of the marks of the previous wheel. Thus, for instance, some of the stove parts mentioned above were given first a 46-grain operation and then two dry operations with 120 grain to remove completely the marks of the 46 grain. Finally oil was applied to the surface of the 120-grain wheel. Two greasing operations with the same wheel removed the marks of the dry 120 grain and made a total of five finishing operations. The last operation was called "coloring".

Following this, the work was hand wiped with lime using a clean cloth. This accounts for my previous statement that "cleaning of the work prior to plating was easy".

Every polisher in those days had a "polishing stone", and it was his most precious possession. The stone was applied to the wheel after the final greasing operation to remove surplus grease and "lay" the emery grain. It was applied to the coloring wheel at frequent intervals to prevent the wheel from scratching the work. With its use the nickel plate was given a mirror finish on a six- or eight-inch-diameter cloth buff.

Wire Brushing

A wire wheel was created in those early days to produce the snow-white background plate mentioned previously. The wheel was made from two castings: one had the hub and a flange with pins or prongs to hold the wire; the other was a flange with holes to fit over the prongs. The steel wire was cut to length and assembled in uniform bundles which had one end twisted around a mandrel to form a loop to fit over the prongs. Six bundles were mounted on each prong of the hub casting after the latter had been placed on the lathe arbor, the flange casting was placed over the prongs, and the assembly bolted together. The resulting wheel was 12 inches in diameter. Insofar as I know, this was the first wire wheel used for brushing sand or other adhesions from the castings prior to polishing*. Its originator was my uncle, Moses Brunelle, supervisor of the plating department.

Corrosion Resistant Coatings

With further reference to the absence of corrosion or rusting, it is my considered opinion that (1) (I have no way of proving this point) the materials used in the plating bath were more virgin or pure, (2) the castings were better, and (3) the polishing methods already described, combined with a really good coating of nickel and resulting ease of buffing, provided an undamaged coating to protect the base metal†.

While it is not my purpose to cast reflections upon present day practices, I have no hesitancy in stating that a comparison of polishing methods in the period I am covering with those employed in more recent times proves that polishing has become more or less a lost art. For some time before I retired from active participation in the industry in 1929, stress was being laid upon heavier plating with as little polishing as possible prior to plating. This is the exact reverse of the practice required to give a really good product.

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*Wire wheels for scratch brushing (on lathes) are shown in "Manipulations Hydroplastics" by the French electroplater. A. Roseleur (1853) (Editor). †It should be noted that the tremendous increase in coal consumption has made the atmosphere much more corrosive (Editor).

In addition, buffing after plating (which may involve nickel, copper, nickel) is accomplished with plenty of composition on a 14-inch buff. This tends to cut off a considerable portion of the plated coating, leaving the product deficient in corrosion resistance.

At the risk of making myself unpopular with the cloth whee! fabricators, I do wish to add one comment on the controversial subject of polishing wheels. In my opinion rag or cloth wheels were never intended for greasing or finishing work of any kind.

Improvements

After three or four years with W. C. Davis Stove Company I entered the service of the Harvey Miller Plating Works, job platers. The materials and equipment in this plant were similar to those already described. However, several improvements took place during my eight years there with the introduction of walrus leather wheels, felt wheels, round buffs, etc.*

The plating tanks used in this period were made of wood and lined with tar; the cleaning tanks were caldron kettles. The latter looked like the kettle drum used in an orchestra. It was mounted upon a cast iron frame and heated externally with a coal fire, or, if steam was available, with steam coils installed under the kettle.

Bath Purification

An interesting experience with solution contamination and purification occurred when the Favorite Stove and Range Company moved to Piquia, Ohio. The solutions had been placed in vinegar, wine, and whiskey barrels for transport to the new location. When I re-entered the employ of the stove company, I found the solutions back in the tanks but incapable of plating. In order to remedy the situation, we emptied and cleaned the caldron kettles, placed the plating solutions in them and concentrated the solutions by boiling off water until all the plating tanks had been emptied. New plating solutions were then built from the concentrates and new nickel salts; they worked perfectly. As I recall it, four days' and four nights' boiling were required to concentrate the solutions. The method was one which had been employed in reclaiming a solution under the direction of Mr. Miller while I was in his employ.

Pitting and Spotting Out

My early experiences did not include any real plating griefs. For example, up to the time that I entered the selling field, I had never encountered pitting. This may be attributed to the fact that the industry concentrated on quality. However, with the beginning of mass production of bicycles, quality was sacrificed for quantity and plating troubles began to multiply†.

We naturally did have our troubles with spotting out on brass and copper plate. These troubles were overcome by placing all items that had a tendency to spot out, whether racked or wired, in an oven immediately following the hot water rinse and drying them at a high heat for at least an hour. The parts were then buffed and lacquered.

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*First mentioned by A. Roseleur in 1853 (Editor). †Other early mass production industries using plating were the silverware industry and the hardware industry (Editor).

THE USE OF PLASTIC BEADS IN CHROMIUM PLATING TANKS*

ARTHUR C. STERN, LAWRENCE P. BENJAMIN, HARRY GOLDBERG

Division of Industrial Hygiene and Safety Standards,
New York State Department of Labor

The Problem

In Chromium Plating large quantities of hydrogen and oxygen are set free at the electrodes. The bubbles of these gases burst on the bath surface and disperse in the air minute droplets of the solution which constitute a health hazard. This hazard frequently manifests itself as severe dermatitis and skin ulceration on prolonged contact or as a perforated septum on prolonged inhalation. The maximum allowable concentration of chromic acid in the atmosphere is generally accepted as 0.1 mg/cu.m.[1]

Experience has shown that the hazard can be adequately controlled by the use of local exhaust ventilation applied laterally from two sides of the chromium plating tank, with slots from 1 to 2 inches wide depending on the tank width and with a ventilation rate of 120 to 150 cfm/sq.ft. of tank area.

The present study was undertaken to answer the questions which arose when a number of chromium plating establishments asked permission to use a layer of plastic beads, in the form of solid rods or hollow tubes with sealed ends, as a substitute for exhaust ventilation or with a lower rate of exhaust ventilation than 120 to 150 cfm/sq.ft.

Functions of Beads

The primary function of the beads is to provide a large solid surface against which the ascending bubbles can break and thus allow the gases to escape without violent bursting. The secondary function is to provide a large wetted surface above the solution level against which the mist droplets can impinge and become trapped.

Earlier Investigations

Davis[2] has published data derived from a similar study at the Naval Air Station, Pensacola, Fla. He reported air concentrations of 4.5–5.0, 0.02–0.05, and 16–17 mg/cu.m. chromic acid with exhaust rates of 170 cfm/sq.ft. without beads, 170 cfm/sq.ft. with 2½ lb/sq.ft. beads, and 0 cfm/sq.ft. with 2½ lb/sq.ft. beads, respectively. Molos[3] found 1.9–3.0 mg/cu.m. chromic acid in one plant without ventilation but using beads.

Results of Tests

Our results are summarized in Table I.

Light-wired work was not rigid enough to spread apart a heavy bead layer which therefore had to be done separately by the operator. If he did not push back the beads into position after immersing this type of work, the liquid currents kept them separated and ineffective. Structurally rigid and massive or rigidly racked work itself spread the beads apart for entry and allowed them to return to position before the updraft of the bubbles began.

Conclusions

The following conclusions were reached from a study of the data obtained:

1. The plastic beads by themselves are not capable of reducing chromic acid mist concentration to within permissible limits.
2. They assist local exhaust ventilation in further decreasing the mist concentration and are recommended for this reason.
3. It does not seem wise to recommend a decrease in the exhaust ventilation rate because of (a) resistance of operators to the use of beads, (b) possible drag-out losses of beads reducing the thickness of the bead layer, (c) possible insufficient initial thickness of bead layer, and (d) possible operation of tank with areas not covered by beads.

Acknowledgment

We wish to acknowledge the assistance of Hanson-Van Winkle-Munning Company, Lea Manufacturing Company and The Udylite Corporation for supplying the beads used for this series of tests and for their generous cooperation and technical assistance.

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*A condensation of the original article.

TABLE I. EFFECT OF BLANKETING CHROMIUM BATHS WITH POLYSTYRENE MATERIAL ON AIR CONTAMINATION

Tank No.	Solution Area sq.ft.	Current amp	Blanket* Thickness inch	Ventilation		Chromic Acid Concentration in Breathing Zone mg/cu.m.‡
				Slot† Velocity fpm	Volume cfm/ sq.ft.	
Hollow, Sealed Plastic Tubes, 3/8 inch diameter, 2¾ inch long						
1	16	600	0	0	0	49.8
		600	2	0	0	3.38
		900	0	1050	131	0.51
		1900	2	1050	131	<0.05§
2	30	700	0	0	0	12.3
		1250	1.5	0	0	0.8
		1250	0	900	90	0.15
		1200	0.75	900	90	<0.05§
		1250	1.5	900	90	<0.05§
5	24	1100	0	0	0	56.9
		1100	1.0	0	0	4.03
		1200	0	900	113	0.001
		1250	1.0	900	113	0.001
6	16¶	750	0	0	0	9.26
		750	0.375	0	0	0.876
		600	0.75	0	0	0.383
Solid Plastic Rods, 1/8 inch diameter, 1¾ inch long						
3*	6	200	0	0	0	5.90
		200	0.75	0	0	2.91
		200	1.1	0	0	0.625
		200	0	800	100	0.003
		200	0.75	800	100	0.010
		200	1.1	800	100	0.007
4	10	350	0	0	0	12.9
		350	0.125	0	0	4.40
		350	0.25	0	0	2.72
		350	0.375	0	0	2.10
		350	0	900	113	0.015
		350	0.125	900	113	0.001
		350	0.25	900	113	0.001
		350	0.375	900	113	0.026

*A blanket thickness of 1 inch is had with about 1½ lb tubes or about 4 lb rods per sq.ft.

†Slot width 1.5 inch in each case.

‡Air sampling with Hatch's modification of Greenburg-Smith impinger filled with 75 ml 0.01 *N* sodium hydroxide. Sampling rate 0.90 ± 0.05 cfm. Iodometric analysis of air over tanks 1 and 2 (sensitivity abt. 0.05 mg CrO_3/cu.m.); colorimetric analysis with diphenylcarbazide of air over tanks 3–6 (sensitivity 0.001 mg CrO_3/cu.m.).

§Probably near 0.001.

¶Hoods over slots reduced effective area from 24 to 16 sq.ft.

*Strong draft away from operators' breathing zone

CONSERVATION OF CHROMIC ACID

K. GUSTAF SODERBERG

Graham, Crowley & Associates, Inc., Jenkintown, Pa.

THE PRESENT SHORTAGE of chromic acid affects a number of industries. As indicated previously in this journal[1] it has been brought about by the high level of demand, the retirement of one of the three producers, Martin Dennis Company, from this field of activity, and shortage of supply of raw material. According to the present suppliers[1], Mutual Chemical Company of America and E. I. du Pont de Nemours & Company, they have not reduced their production or decreased the amount sold to domestic consumers and their output is being allocated fairly among their customers.

In face of this situation, the consumers themselves must take every step to conserve available supply by reducing or eliminating waste and by substitution of alternate materials wherever possible.

Chromium Plating

There are three principal ways in which chromic acid consumption can be cut in chromium plating. Two of them deal directly with waste curtailment, namely, lessening of spray losses and of dragout losses; the third deals with reduction of the unavoidable losses by spray and dragout, namely, lowering of the chromic acid content of the plating solution.

Spray losses.—The loss of chromic acid by spray is reported to amount to as much as 5 to 10 times the amount deposited by plating on the work. Two means have been used to reduce the spray: (1) blanketing the solution surface with small pieces of polystyrene plastic, and (2) addition to the solution of a surface tension lowering agent. The former method is said[2] to save 50 to 75 per cent of the amount of chromic acid used; the latter, which is claimed[3] to work best in baths containing 30 to 45 oz/gal chromic acid with the usual sulfate ratio, is said[3] to accomplish savings up to 95 per cent.

Both methods not only save chromic acid but also reduce the health hazards in the plating room. Recently obtained data by the Division of Industrial Hygiene and Safety Standards of New York State Department of Labor[4] are presented in this issue.

Drag-out losses.—Drag-out losses are very substantial, especially because of the high chromic acid content of chromium plating solutions. Most important in the reduction of these losses is the use of a drag-out tank, which is simply a device to cut the concentration of the ultimate drag-out. To be effective, however, the drag-out tank should be agitated either with air or propeller agitation. Also, and this is most important, when the solution in the drag-out tank has reached a substantial concentration, say 10 to 20 per cent of that of the plating solution, it should be replaced by fresh water and evaporated sufficiently to be put back into the plating tank to make up for spray losses.

The volume of drag-out can often be reduced very substantially. Soderberg[5] in a systematic study of drag-out showed experimentally that drag-out can be reduced by (1) withdrawing the part slowly out of the solution, (2) increasing the drainage time above the solution (hand tanks may be supplied with drainage rods for the racks or hooks), (3) for a given total drag-out time period, keeping the withdrawal time as long as possible and the drainage time as short as possible, (4) racking the parts so that solution can flow off at a tip or corner, that there are no horizontal surfaces, and that there are no solution pockets (some parts need drainage holes large enough to permit flow of solution), (5) arranging the rack so that drip from one part does not fall on another part below it.

Bath concentration.—There certainly is no justification under present conditions for the use of the 55 oz/gal bath instead of the 33 oz/gal bath. In fact, the work by Grube and Clifton[6] has shown that satisfactory bright chromium deposits can be had from baths containing as little as 10 oz/gal chromic acid provided that other conditions are changed accordingly. To permit the use of the same current generating equipment with its limit on voltage output, the drop in solution conductivity usually must be counteracted by the use of higher bath temperature. To make up for the detrimental effects of low chromium content and high temperature on the throwing power, the chromic acid/sulfate ratio must be raised beyond its usual value of 100/1 and a balance struck between the brown to iridescent stain formation found at high ratios and the low throwing power encountered at low ratios.

Chromic Acid Anodizing

Substitution.—Frequently sulfuric acid anodizing followed by a dichromate sealing operation can be substituted for chromic acid anodizing. The change is

particularly easy when the chromic acid unit has been powered with a bank of low voltage rectifiers in a series hook-up; these can be employed singly or in pairs to supply the lower voltage and higher amperage required in sulfuric acid anodizing. Where paint adhesion is the only reason for use of anodizing, an alkaline dichromate process, such as the Alrok process[7], may be used to advantage.

Drag-out and spray losses.—These have been discussed in detail under Chromium Plating.

Dumping losses.—When a treatment bath has gradually become contaminated with reaction products, dumping is usually thought in order. Chromic acid anodizing solutions become contaminated with trivalent chromium through use of wooden lattices in the tank, introduction of other organic substances, or reaction with aluminum parts not removed from the bottom of the tank, but the trivalent chromium gradually becomes reoxidized on continued operation after the source has been removed[9]. More important is the contamination with aluminum which combines with chromic acid to form undissociated, soluble aluminum dichromate, a useless constituent of the bath. Three methods are being employed to reduce or eliminate losses from this source: (1) periodic discard of portions of the bath, (2) periodic withdrawal of portions of the bath, treatment of the withdrawn portions, and their return to the tank, and (3) maintenance of bath *p*H with sulfuric acid, chromic acid being used only to make up for drag-out losses.

In the first method[8,9] the *p*H is maintained at 0.8–0.9 with chromic acid additions, but the total chromic acid content is not allowed to rise above 10 per cent (100 g/l). When the bath requires an addition which would bring the total chromic acid content to a higher value, a portion of the bath is discarded. Darrin[9] has developed formulas for determining how much solution to dump and how much chromic acid to add. The graph in Fig. 1 has been plotted from these formulas and can be used when the total chromic acid content is kept at 10 per cent at all times. For example, if the desired *p*H is 0.9 and the observed *p*H is 1.3, one should discard 6 per cent of the solution and add 5.0 lb chromic acid per 100 gallons.

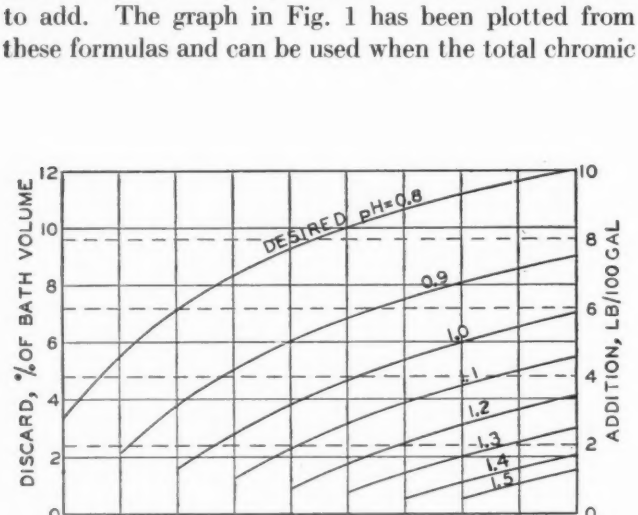

Fig. 1. Chart for the determination of volumes of discard from and chromic acid additions to anodizing solutions containing 10 per cent total chromic acid

In the second method[10] a withdrawn portion is treated with sodium, potassium or calcium hydroxide, calcium oxide or carbonate to raise the *p*H to not less than 3, whereby the aluminum is precipitated as aluminum hydroxide. After separation of the precipitate, the solution is electrolyzed as the anolyte in a diaphragm cell until its *p*H falls below 1.3 and then mixed with the bulk of the bath. The original patent should be consulted[13].

The use of the third method[11], originally developed and employed by San Diego Naval Air Station, requires certain changes in tank construction. Carbon slabs or bars are used for cathodes (National Carbon Company's Furnace Electrode Stock, Grade AGR, behaved well in test runs, but Grade AKX or Karbate is expected to give even better service). The tank is protected by several coatings of chromic acid resistant paint and kept in the cathodic circuit for protection of exposed steel in pores of the coating.

The following is given as an example of successful operation: A new bath was made up to 2.5 per cent chromic acid. Additions of chromic acid were made when necessary to maintain a current density of not less than 1.5 asf on aluminum alloy 24ST. When the total chromic acid content had reached 10 per cent, further maintenance of current density was done with concentrated sulfuric acid, a current density of 2.3 asf being considered maximum. Chromic acid was added only when the total chromic acid content drops below ten per cent.

The current density is controlled with a current density meter. It consists of a known area, preferably 1 sq. ft. of the metal being treated, with an integral suspension strip attached to a low-current ammeter. The latter, in turn, is attached to a hook which permits the whole assembly to be hung on the work rod with the known area of aluminum alloy immersed in the bath. It should be noted that the *p*H relations existing in the straight chromic acid bath no longer hold and that the total chromic acid content, i. e., the total hexavalent chromium content in terms of chromic acid, should be determined by analysis using the methods employed for chromium plating solutions.

It has been shown that at high voltage in the chromic-sulfuric acid bath some alloys draw much more current than others and that the difference between alloys becomes less as the voltage is lowered. Hence, if it is desired to anodize a variety of alloys in the same bath, one had better operate at 20 to 25 volts for the same number of ampere-minutes per sq. ft. as in the straight chromic acid bath to get the same film thickness. Where production conditions permit, one should preferably use separate baths for alloys with widely different current density characteristics and reduce

(*Continued on page 579*)

STRIPPING OF COPPER

V. DEPLATING IN CYANIDE SOLUTIONS

Introduction

This phase of the project was concerned with the deplating of copper from ferrous basis metals in cyanide solutions.

The method has been described in the literature where a number of solutions and operating conditions are given. For this study, a solution was chosen which is in commercial use and which is considered representative of the baths normally employed.

The composition of this solution was

Copper cyanide... 5.4 oz/gal (40 g/l)
Sodium cyanide...10.8 oz/gal (80 g/l)
Trisodium phosphate..... 8.0 oz/gal (60 g/l)
Sodium hydroxide to give *p*H 12.2

A number of the variables were studied to determine the useful life of such a bath and the factors which affect the stripping rate.

General Experimental Conditions

The work for the most part was carried out in small beakers employing 100 ml of solution. Since a number of life tests were anticipated, it was deemed advisable to employ relatively small volumes in order to speed up the work. This point will become apparent when it is shown later in the experimental data that even with the volume chosen, some of the life tests ran forty to fifty hours.

A small piece (about 2 sq.in. total area) of a cast or rolled copper anode was suspended by a platinum wire in the center of the solution with cathodes on both sides. The temperature was maintained at 82° C (180° F) throughout. The current was kept at 0.3 amperes, which was equivalent to an anode current density of about 20 asf.

Preliminary tests were run to determine the solubility of copper in the solutions under the conditions outlined above and without current. Values of the order of 0.003–0.01 g/hr, sq. in. (0.000021–0.00007 inch/hr) were obtained. These losses were considered small enough to be neglected in the calculations.

One of the first points considered was the necessity for having copper cyanide in the bath as made up. The standard solution was compared with a second solution which was identical with it except that the copper cyanide had been replaced by sodium cyanide. The additional amount of sodium cyanide, 2.8 oz/gal (20.9 g/l), made the total cyanide content of the two baths equal. The *p*H of both solutions was maintained at 12.2. The solutions were electrolyzed at 20 asf anode current density, and the anodes and cathodes were removed and weighed at intervals.

The solution containing no copper cyanide built up in copper content as the electrolysis progressed. The total amount of copper removed in each bath at the end of fifty hours was about the same. It is, therefore, concluded that copper cyanide is not essential in the original makeup of the bath.

Regeneration of Spent Solutions

The average anode efficiencies in the two baths was about 80 per cent. However, during the latter part of the run, the efficiencies had decreased to 29 and 33 per cent, respectively. These solutions were considered to be spent, and several methods were tried in order to increase their life or regenerate them.

Stirring of the solution produced some improvement in the stripping rate.

An increase in temperature, above 82° C, was also effective for a short period of time.

During the 50-hour run, the temperature and *p*H had been kept constant, but no attempt had been made to keep the solutions in balance with cyanide replace-

a. e. s. research project no. 1

project director:
F. C. MATHERS

associate:

E. L. MARTIN

location:

UNIVERSITY OF INDIANA

BLOOMINGTON, IND.

Acknowledgment is due the Research Committee, Mr. C. E. Heussner, Chrysler Corporation, Chairman; the Research Directing Committee, Dr. R. M. Wick, Bethlehem Steel Company, and Dr. Louis Weisberg, Consulting Chemist, New York City, Chairman and Vice-Chairman, respectively; and the Project Committee, Mr. L. E. Weeg, C. G. Conn Ltd., Chairman; Mr. L. C. Borchert, Houdaille-Hershey Corporation, and Dr. H. J. Wiesner, C. G. Conn Ltd., for their contribution to this project.

ments. Additions of sodium cyanide were now made to these spent baths. Large additions were effective, but only for periods of 4 to 5 hours. After that, the anode efficiencies dropped markedly.

It would seem probable that the inability of the baths to be regenerated by large additions of sodium cyanide was due to the formation of decomposition products. It was assumed that these products were carbonates for the most part. After their removal had been accomplished by chilling the solutions to 0° C (32° F) and filtering, the solutions operated near their maximum efficiencies after the original cyanide concentrations had been restored.

TABLE I. EFFECT OF ELECTROLYSIS WITH STEEL ANODES ON SUBSEQUENT RATE OF COPPER STRIPPING

Test No.	Time of Electrolysis hr.	Rate of Subsequent Copper Stripping	
		g/hr	inch/hr
1	5	0.882	0.0028
2	10	0.625	0.0020
3	15	0.224	0.0007
4	20	0.012	0.00004

Effect of Bare Basis Metal

It is not uncommon in stripping operations to have areas of the basis metal, originally underlying thin coatings of copper, exposed for an appreciable length of time while the heavier copper plate is still being removed. It was therefore of interest and importance to determine what effect the use of insoluble steel anodes would have upon the life of the bath.

Low- and high-carbon steel specimens were used as anodes in fresh solution samples of standard composition. Four samples were electrolyzed for increasing lengths of time with steel anodes. At the end of these periods, the steel was removed and copper anodes substituted during two-hour runs.

That the use of insoluble low-carbon steel anodes had caused decomposition of cyanide and reduced the stripping rate of the bath is shown in Table I. The results with high-carbon anodes were very similar.

Effect of Salt Additions

Various sodium salts were added to samples of a standard bath containing only

Sodium cyanide...10.75 oz/gal (80 g/l)
Copper cyanide... 5.4 oz/gal (40 g/l)

Trisodium phosphate up to 16 oz/gal (120 g/l) was found to be beneficial in maintaining a clean anode.

High concentrations of *sodium hydroxide* and *sodium carbonate* caused anode films to form.

Sodium bisulfite and *sodium sulfite* gave beneficial results in prolonging the life of the solution. These salts probably retarded the oxidation of cyanide. However, large concentrations caused etching of the basis metal.

Sodium sulfate showed no harmful effect.

Sodium borate decreased the stripping rate.

Sodium formate in high concentrations decreased the stripping rate.

Sodium chloride appeared not to affect the stripping rate but caused severe etching of the basis metal.

Sodium pyrophosphate caused a decrease in stripping rate over long periods of time.

Magnesium sulfate caused a rapid decrease in stripping rate.

Of the above-mentioned compounds, trisodium phosphate appeared to be the most promising from the standpoint of maintaining a clean anode. Relatively high concentrations also had no harmful effect on the basis metal.

The *optimum pH range* found in these experiments was 11.9–12.5. Baths may be operated above and below this range; however, as the *p*H is lowered, there is a greater tendency for attack on the basis metal, and as the *p*H is raised above 12.5, the anodes tend to become coated with a film which reduced the stripping rate.

Effect of Organic Bases

Several organic bases were tested in an attempt to increase the life of the stripping solution. A list of the bases employed for this purpose is given below:

Ethanolamine
Ethylenediamine (65 and 95 per cent solutions)
Phenyl trimethyl ammonium hydroxide
Dichlorohexylamine
Tetrone "B"
Cyclohexylamine

They were added in amounts of 3 or 5ml to 100 ml portions of a stripping solution of the following composition:

Sodium cyanide...10.75 oz/gal (80 g/l)
Copper cyanide... 5.4 oz/gal (40 g/l)
Trisodium phosphate..... 8.0 oz/gal (60 g/l)

After a few preliminary tests the list of promising bases was quickly narrowed to three: cyclohexylamine, ethylenediamine, and ethanolamine.

Further tests consisting of 10-hour runs with insoluble steel anodes followed by a period of electrolysis with copper anodes showed *cyclohexylamine* to be the most effective in retarding the decomposition of the bath.

Also, solutions containing cyclohexylamine had a stripping rate superior to one containing sodium hydroxide. The fol-

(*Continued on page 575*)

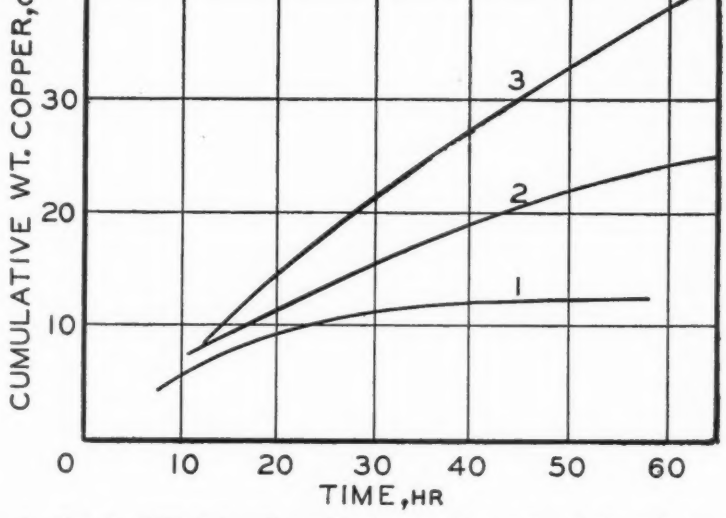

Fig. 1. Results of life tests with combined copper, low-carbon steel anodes at an anode current density of 20 asf in solutions at 82° C (180° F) containing 5.4 oz/gal copper cyanide, 10.8 oz/gal sodium cyanide, 8.0 oz/gal trisodium phosphate (1) without further addition, (2) with sufficient sodium hydroxide to raise pH to 12.2, and (3) with addition of 6.7 oz/gal each of sodium sulfite and cyclohexylamine

Stripping of Copper

(Continued from page 570)

lowing experiments are quoted: A life test was carried out on 100 ml of stock solution to which had been added 5 ml of cyclohexylamine. In 40 hours the solution had removed 30 grams of copper and was holding up well. At the end of 80 hours, the solution was depleted, but it had removed 45 grams of copper, which was considerably more than had been stripped by any previous solution.

Another solution of the same composition was operated for 40 hours when, as in the previous test, 30 grams of copper had been stripped. At this point, 2.5 grams of sodium cyanide were added and the solution continued in operation. In the next 49 hours, 33 grams of copper were stripped, and at the end of 89 hours, the solution was still operating as efficiently as a fresh solution.

In the earlier tests, approximately one gram of sodium cyanide had been consumed for each 3.0 to 3.3 grams of copper removed. With 5 ml of cyclohexylamine/100 ml solution this average increased to 5.4 grams of copper per gram of sodium cyanide.

Because the cyclohexylamine apparently retarded the oxidation of the cyanide, it was thought that it might work even better in the presence of a reducing agent. *Sodium sulfite* had shown promise in previous experiments, but such large amounts were needed that the basis metal became seriously etched. It was thought that a smaller amount might be effective in further prolonging the life of the solution when cyclohexylamine was present. Five grams of sodium sulfite were added to 100 ml of stock solution containing 5 grams of cyclohexylamine. The resulting solution was found to be noncorrosive to low carbon steel employed as an anode.

The results of some life tests are shown graphically in Fig. 1.

It is apparent from a comparison between the curves that cyclohexylamine and sodium sulfite are effective in prolonging the life of the stripping solution. That *p*H is an important factor in maintaining an effective stripping bath may be seen by comparing curves 1 and 2.

Effect of Stirring

In these experiments 200 ml of solution were employed. Agitation was accomplished with glass stirrers rotating at 75 to 80 rpm. A comparison was made, using copper anodes, between the solutions designated 2 and 3 in Fig. 1. Since the volume was double that used in previous experiments, the results are probably best expressed in terms of the weight of copper removed per unit weight of sodium cyanide consumed. For completeness, the data on a comparison of the same baths without stirring are also included. The results are recorded in Table II.

TABLE II. COMPARISON OF AGITATED AND STILL BATHS
0.3 amp on 2-sq. in. specimens

Solution No.	Agitation	Amount of Copper Stripped		Ratio (g Cu/g NaCN) agit.
		g	g Cu/g NaCN	(g Cu/g NaCN) still
2	Yes*	116*	5.8	
	No†	33†	3.3	1.8
3	Yes*	203*	10.0	
	No†	60†	6.0	1.7

*Volume of agitated bath, 200 ml †Volume of still bath, 100 ml

Two points are apparent from examining Table II. First, the stripping capacities of both solutions are greatly enhanced by the use of agitation, both being improved to about the same extent, as shown in the last column of the table. Second, the longer life of the solution containing cyclohexylamine and sodium sulfite (solution 3) is evident when it is operated both still and agitated.

In a second series of life tests on agitated solutions, baths of the same compositions were operated for ten hours with malleable iron or high-carbon steel anodes, after which these were replaced with combination anodes of copper and high-carbon steel. The results are shown graphically in Fig. 2. While the electrolysis with malleable iron anodes affected the lives of both baths, the useful life of solution 3 was approximately ⅓ longer than that of solution 2.

No attempt was made to maintain the free cyanide content in these runs. This

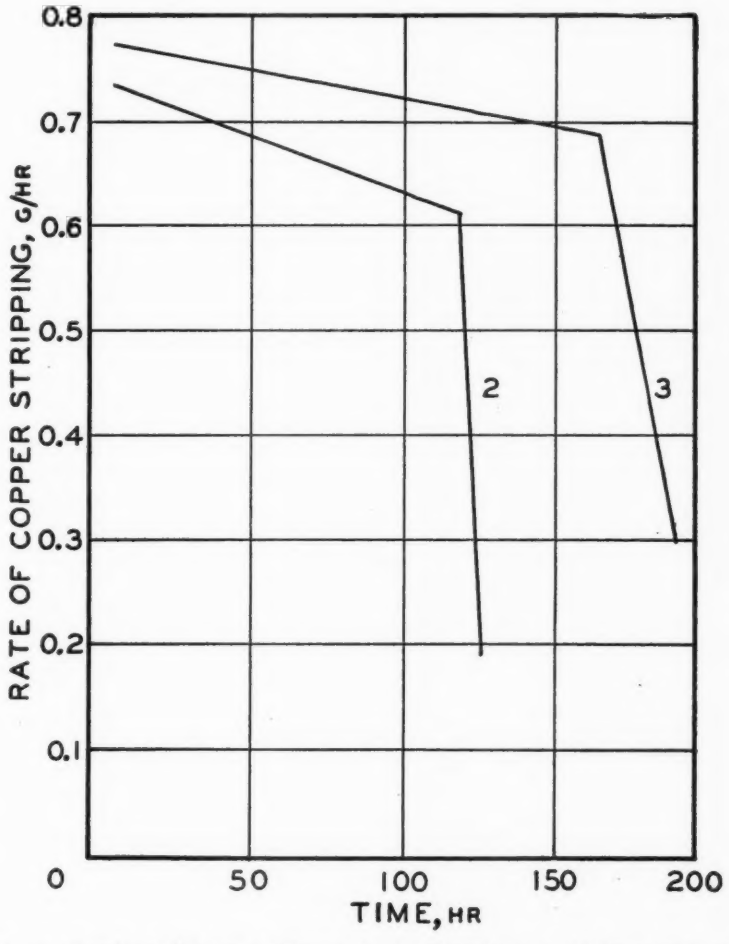

Fig. 2. Results of life tests, following initial electrolysis for 10 hours with malleable iron or high-carbon steel anodes, with combined copper, high-carbon steel anodes at 20 asf in solutions (2) and (3) of the composition shown in Fig. 1 at 82° C (180° F). Rates plotted at end of unknown time periods

accounts for the abrupt drop in the stripping rates of the two solutions after about 115 and 170 hours.

Summary and Conclusions

1. A commercial cyanide solution for the deplating of copper from ferrous basis metals has been studied.

2. The prolonged use of bare steel anodes causes rapid deterioration of the solution with a subsequent decrease in the stripping rate.

3. Solutions which have been depleted in such a manner may be regenerated only by removal of the carbonates which have formed and replacement of the cyanide which has decomposed.

4. Control of the *p*H of the stripping bath between the limits of 11.9–12.5 greatly assists in maintaining the maximum stripping rate. At *p*H values appreciably lower than 11.9, attack of the basis metal was encountered.

5. The addition of a number of inorganic salts was tried and their effects noted.

6. Several organic bases were tried as substitutes for sodium hydroxide.

7. Cyclohexylamine in combination with sodium sulfite was found to be beneficial in extending the life of the bath.

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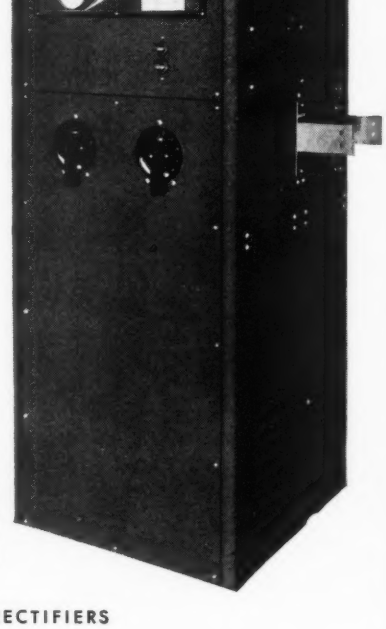

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Metallurgical Aspects

(Continued from page 561)

plastic elongation might be about 0.3 per cent. The present writers feel that, while any of these tests are quite rough, they can be used in shop control of plate brittleness and, accordingly, of bath purity. Experience with bright nickel deposits has shown that this

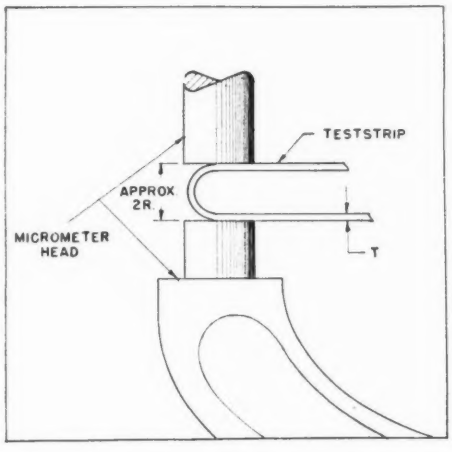

Fig. 19. Shop test for ductility of peeled electrodeposits, using a micrometer

method will detect considerable variations in brittleness before any effect on the bright range is observed in a bent cathode test. In this test the cathodes were prepared from 1 x 6 inch strips of polished and buffed brass shim stock, bent to form a V 3 inches from the top of the strip. The top leg of the V is in horizontal position and the other leg forms a 45° angle with this horizontal, the apex of the angle being 1 inch from the vertical section of the strip; the bottom ½ inch was straightened to form a straight line with the top 2½-inch portion.

Table IV shows the results of one series of ductility tests with peeled nickel deposits. It will be observed that the secondary brightener, the non-pitter and small amounts of the primary brightener did not produce any loss in ductility, a measurement of 0.002 inch for 2R being equal to twice the thickness of the deposit and hence representing the practical limit of the method. Test No. 6 represents the recommended bath composition; the bright range as observed on the bent cathode is satisfactory, but the deposit has definitely lost ductility at this point. It is particularly interesting to note that the method of measuring the ductility of this particular deposit is very critical: if the peeled deposit is bent with the original nickel-steel interface convex, the measured loss in ductility is considerably higher than if this surface were concave.

The subject of brittleness in bright nickel deposits has been of considerable interest for some time. Most bright nickels are none too ductile, and when they are chromium plated, the brittleness is increased about five times.

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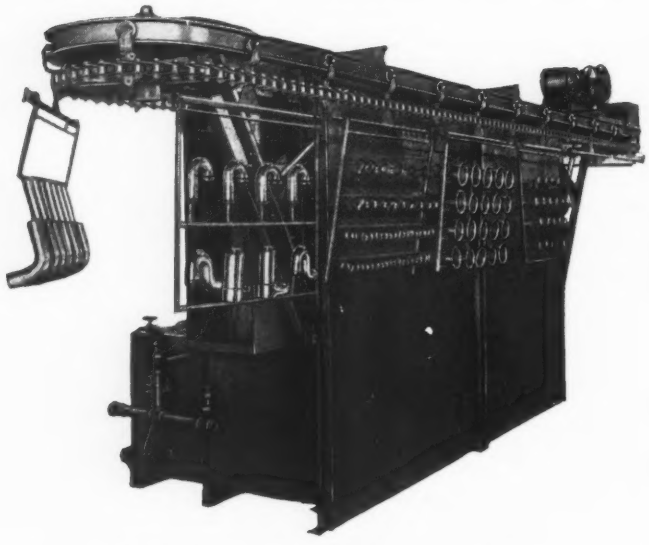

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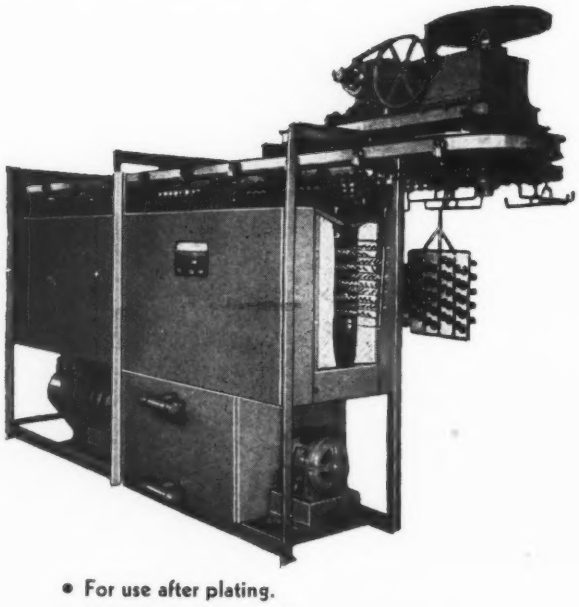

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The range of elongations of chromium plated bright nickel foil observed by the writers has been 0.5 per cent to 17 per cent. There is a great deal of variation in deposits from the same bath at different times and in deposits from the same type of bath in different plants. Iron, copper and chromium trace impurities tend to produce some brittleness. A more common cause seems to be the presence of breakdown products of the organic brightener and other addition agents. Most of these breakdown products are unidentified and some, apparently, are not removable by the usual methods of purification such as oxidation, adsorption, and low current density electrolysis. Carbon dioxide has been shown to be an important source of brittleness[10].

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(To be continued in the July issue)

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Conservation of Chromic Acid

(Continued from page 567)

the time of treatment for those alloys which draw the most current. The data in Table I provide an indication of these characteristics.

TABLE I. CURRENT DENSITY CHARACTERISTICS OF ALUMINUM ALLOYS

Bath containing 100 g/l chromic acid, 50 g/l sulfate *p*H = 1.04–1,08, 95° F

Volt	asf drawn by Alloy No.				
	24S-T	3S-½H	Alclad 24S-T	2S	52S-½H
20	2.4	2.6	2.8	2.9	3.4
40	2.6	9.3	21.6	14.1	40.7

Miscellaneous Processes

Paint adhesion.—Several vendors offer phosphate treatments to take the place of chromic acid treatments of cadmium plate for improved paint adhesion.

Bright dips.—Chromic acid bright dips for cadmium and zinc are usually dumped when the trivalent chromium content has risen to a point which makes them inoperative. The trivalent chromium content may be reduced by means of the porous cup method applied when the solution is not in use.

The chromic acid bright dip for zinc plate has no particular advantage over the nitric acid bright dip except for subsequent lacquer adhesion. The same or better results may be had by nitric acid dipping followed by immersion in a weak chromic acid solution free from other acid radicals.

Copper stripping.—Since several alternative methods are available, chromic acid is not necessary for the stripping of copper from steel.

Several stripping methods were offered by suppliers to the plating industry[12] during the last World War. A summary of methods[13] as well as studies of alternate stripping in sulfide and cyanide solutions[14,15] have been published in this journal. The present issue contains a report of a research on electrolytic stripping in cyanide baths (p. 568).

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[14]Mathers, F. C., and Martin, E. L., "Stripping of Copper III. The Calcium Polysulfide-Sodium Cyanide Method". Mo. Rev. Am. Electroplaters' Soc. **33**, 958–962 (1946).

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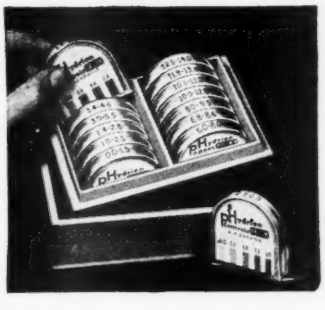
pH Test Papers *for* Electroplaters

This new set of *14* Test Papers covers the entire pH range from pH 1 to 14
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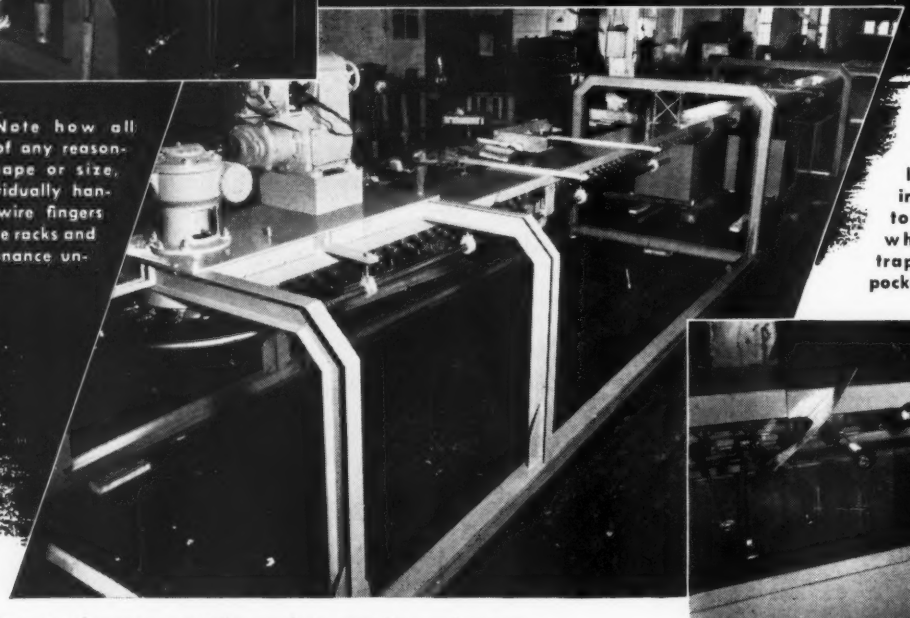
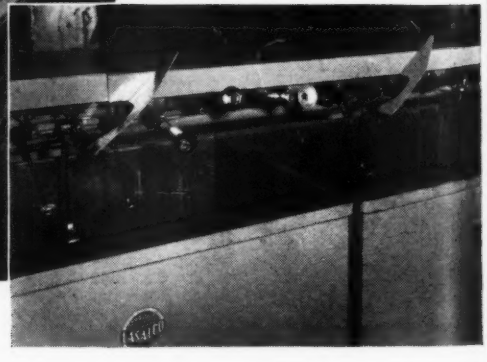
More Production - Better Plating Increased Profits WITH DAW Jr. Type

FULL AUTOMATIC PLATING CONVEYOR

Note how all parts, of any reasonable shape or size, are individually handled on wire fingers which make racks and rack maintenance unnecessary.



Work transfers from tank to tank and is automatically lifted to slightly above horizontal position to prevent carry-over of solution. It is then swung in an arc and lowered to vertical position which eliminates trapped gas or air pockets in work.



Daw Jr. Conveyors are tailor-made to meet the need of any shop, regardless of production capacity or type of work.

Every installation of the completely automatic Daw Jr. Conveyor is one especially built to fit the individual requirements of any desired production capacity or any plating cycle. The continuously moving cathode eliminates entirely all interruptions in work movement and permits the use of considerably higher current densities which greatly increase work speed, assure more uniform plating, cut profit-eating rejects and reduce production costs.

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Daw Jr. Conveyors offer fully automatic plating, bring greater output of finer work and increased profits within the reach of every average sized shop.

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AN APPRECIATION . . .

Newark Branch extends a most cordial and ever hearty welcome to the members of the American Electroplaters' Society and their guests at the 35th Annual Convention in Atlantic City, New Jersey.

This is the third time in the history of the Society that Newark Branch has had the honor to act as its host. The first time was in 1926, when the Convention was held in Newark, New Jersey. The second time was in 1939 in Asbury Park, New Jersey, on the occasion of the Centenary of Electroplating when we welcomed the Second International Electrodeposition Conference.

At this, the third time, Newark Branch cherishes the opportunity of offering Atlantic City hospitality to its many friends.

The several committees have labored hard to plan a worthwhile program of interest to all.

The Educational Sessions have been arranged to cover selected subjects, which will create wide interest and add instructive knowledge.

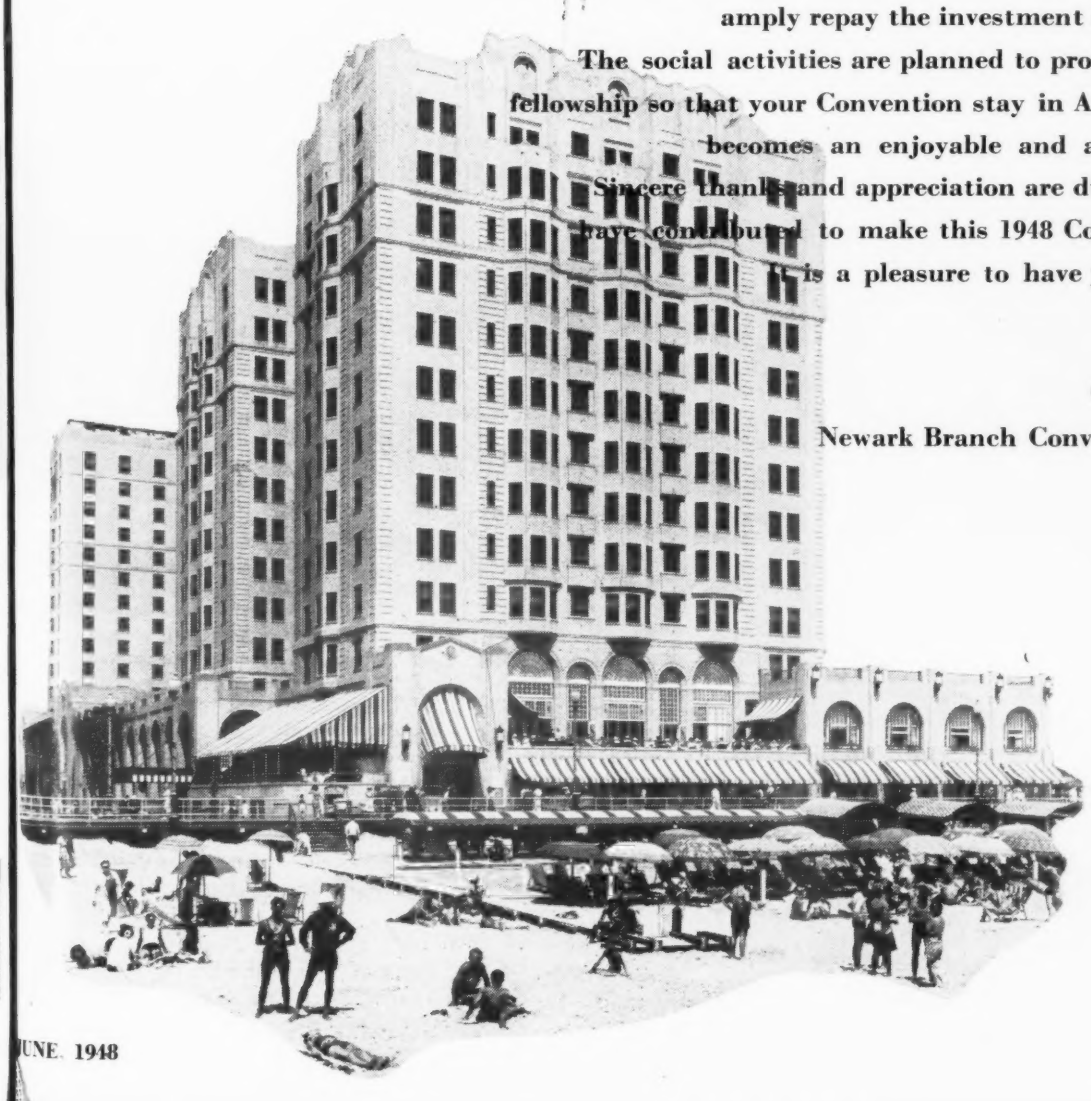
The Industrial Finishing Exposition includes up-to-date equipment processes and materials the inspection of which will amply repay the investment of time and effort.

The social activities are planned to provide good pleasant fellowship so that your Convention stay in Atlantic City, N. J., becomes an enjoyable and a memorable one.

Sincere thanks and appreciation are due one and all who have contributed to make this 1948 Convention possible.

It is a pleasure to have you with us again.

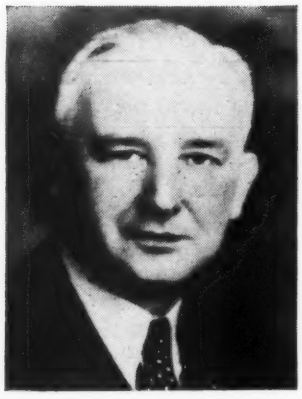
Horace H. Smith
General Chairman
Newark Branch Convention Committee



CONVENTION COMMITTEES

NEWARK BRANCH

GENERAL



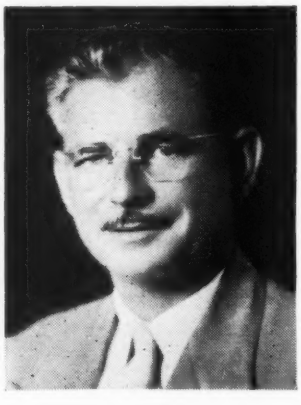
Horace H. Smith
General Chairman

Charter Member and Past President, Newark Branch. Past President, American Electroplaters' Society, 1929 and 1930. Honorary Member, American Electroplaters' Society. Formerly with Tiffany and Company, Newark, N. J. President, Surety Electroplating Company, Newark, N. J.

John L. De Vries
Co-Chairman

B.S. Chem., Rutgers University, 1921. Sales Engineer, Oakite Products, Inc. Member, Board of Managers, Newark Branch.

INDUSTRIAL FINISHING EXPOSITION



George Wagner
Chairman

Past President, Newark Branch. Past President, American Electroplaters' Society, 1944. Plater Apprentice with Cook & Hayse, Brooklyn, N. Y., and Newark, N.J., 1911. Foreman Plater, Standard Metal Manufacturing Company, 1917. Owner, Hy-Grade Electroplating Company, which he started in 1918.

Howard Cobb
Co-Chairman

Graduate, M. I. T., 1923. Formerly employed by Fansteel Products Corporation and Ballantine Laboratories. For last fourteen years with Aircraft Radio Corporation as engineer. Member A. S. M., Radio Club of America. Past President, Newark Branch.

Committee: John L. De Vries, Carl Greiner, Albert E. Howe, John Lavery, A. P. Munning

PROGRAM

EDUCATION

Myron B. Diggin
Chairman

B.S. 1926 and M.A. 1928, Wesleyan University. Chemist with Radcliffe Oil Company, supervisor of Bridges Monmouth Company, since 1930 with Hanson-Van Winkle-Munning Company, now as Technical Director. A. E. S. Gold Medal, 1946. Associate Editor of PLATING. Chairman, A. E. S. Research Project Committee No. 4.

Committee: Samuel S. Frey, Zachary Irenas, Urban Mullin, Robert R. Sizelove

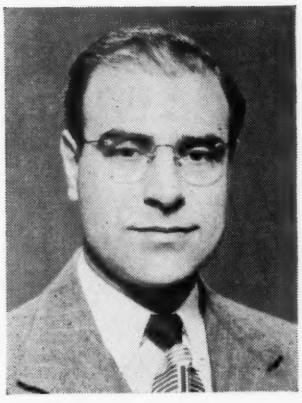
ENTERTAINMENT

Paul A. Oldam
Chairman

Attended Newark Technical School and Pratt Institute of Technology. For past seventeen years with Shiman Manufacturing Company, Newark, as Head, Metal Finishing Department.

Committee: John Gumm, George Reuter

BRANCH EXHIBITS



Louis J. Donroe
Chairman

Pre-med studies at University of Richmond; Ind. Chem. Engineer, Pratt Institite, 1929. With Pyrene Manufacturing Company, 1929–1947 (Chief Chemist since 1934). Now Chief Chemist, Royal Plating and Polishing Company, Newark, N. J. Past President and Member, Board of Managers, Newark Branch.

Committee: Salomon Barr, Robert S. Herwig, Paul A. Oldam

PUBLICITY

William F. Bruhns,
Chairman

Former Vice-President, President and Member, Board of Managers, Newark Branch. Vice-President and Secretary, Surety Electroplating Company, Newark, N. J.

Committee: Robert S. Herwig, Solomon Barr, Charles Muller.

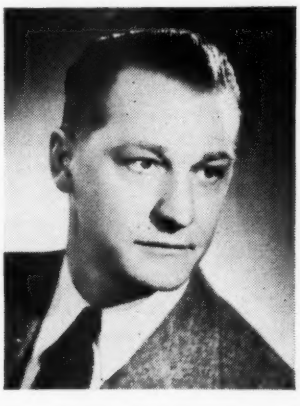
BANQUET

George Reuter
Chairman

Attended Newark Technical School. Foreman, Plating Department, J. Wiss & Sons Company, Newark. Taught plating in Central High School for two years, in Essex County Vocational School for twelve years. Member, Newark Branch, since 1913.

Committee: Salomon Barr, William Grigat

REGISTRATION



John R. Gumm
Chairman

Attended Rutgers University. With Frederick Gumm Chemical Company, Kearny, N. J., for past twelve years.

Committee: Roland Doucette, William Grigat, Charles Muller

GENERAL PROGRAM

SUNDAY, JUNE 27, 1948

3:00 P. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

The registration fee of $10.00 entitles registrant to a book of tickets that can be used for all functions and activities during the Convention. Registrants need not be members of the American Electroplaters' Society. All interested persons are welcome.

MONDAY, JUNE 28, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

9:30 A. M. to 12:00 Noon

OPENING SESSION, Convention Hall Ballroom on the Boardwalk, five minutes' walk from Hotel Ambassador.

Invocation by the Reverend Frank C. Mesle, Member of Rochester Branch, A. E. S. President, 1927.

Welcome to Delegates, Members and Guests by Horace H. Smith, General Convention Chairman, Charter Member of Newark Branch, A. E. S. President, 1929–1930, Honorary Member A. E. S.

Welcome to Atlantic City by the Mayor.

Greetings from Newark Branch by Zachary Irenas, Newark Branch President.

First Business Session. Kenneth M. Huston, A. E. S. President, in the chair.

12:30 P. M.

INTERNATIONAL FELLOWSHIP CLUB'S ANNUAL LUNCHEON (for suppliers and their representatives only).

Following the luncheon there will be election of officers for the coming year and discussion of arrangements for the Open House.

2:00 P. M. to 4:30 P. M.

FIRST EDUCATIONAL SESSION, Convention Hall Ballroom, second floor. William Geissman, S. K. Williams Company, Milwaukee, Wis., presiding.

1. *Industrial Electropolishing*
   Charles L. Faust, Battelle Memorial Institute
2. *Electropolishing Silver in Cyanide Solutions*
   Daniel Gray, Oneida, Ltd.
3. *Diaphragm Tanks To Eliminate Roughness in Copper Plating*
   R. H. McCahan and C. E. MacKinnon, E. I. du Pont de Nemours & Company
4. *Oxidation of Trivalent Chromium in Chromic Acid Plating Baths*
   Robert Seegmiller and Vernon Lamb, National Bureau of Standards

Evening

NATL. ASS'N OF METAL FINISHERS DINNER–BUSINESS MEETING, Surf Room, Ambassador Hotel. Speaker, P. Nelson, Small Business Div., Dept. Commerce.

Abstracts of these papers are found on page 591.

8:30 P. M.

OPEN HOUSE, Renaissance Ballroom, Hotel Ambassador.

Dancing—Buffet Lunch—Refreshments

Presentation of Special Awards

The Open House is held on the first night of the Convention to provide an opportunity for all registrants to become acquainted. It is sponsored by the International Fellowship Club, an organization formed to create good will in the metal finishing industry. Membership in the Club consists of manufacturers, supply houses, and their representatives serving the metal finishing industry, and it is through their generosity that the Open House is made possible. A program including a list of contributors will be distributed. A ticket for this event is included in your registration booklet.

TUESDAY, JUNE 29, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

8:00 A. M.

BRANCH SECRETARIES' BREAKFAST, Room 125, Hotel Ambassador.

9:30 A. M.

SECOND EDUCATIONAL SESSION, Convention Hall Ballroom, second floor. Leonard Weeg, C. G. Conn, Ltd., Elkhart, Ind., presiding.

1. *Description, Design and Production Costs of Conveyorized Spray Finishing System*
   E. Paul Schwartz, L. C. Smith-Corona Typewriter Corporation
2. *The Electroplater's Metals of the Future*
   F. A. Lowenheim, Metal and Thermit Corporation
3. *The Importance of Acid Ratio in the Phosphatization of Steel*
   Nelson F. Murphy and Michael A. Streicher, Department of Chemical Engineering, Virginia Polytechnic Institute
4. *Metal Cleaning*
   George B. Hogaboom, Consultant

Abstracts of these papers are found on pages 591–592.

12:00 Noon

INTERNATIONAL FELLOWSHIP CLUB GOLF TOURNAMENT, Atlantic City Country Club, Northfield, N. J. Joseph J. Duffy, Jr., Pennsylvania Salt Manufacturing Company, Chairman.

Transportation should be arranged through the Golf Committee.

Attractive prizes will be awarded. All handicap groups have a chance to win. An informal luncheon will be served at the Club between 12:00 Noon and 1:30 P. M. Tee-off time is between 1:00 and 2:00 P. M. Bring your sticks and shoes; a limited number of rental sets will be available at the Club.

Afternoon and Evening

It is suggested that this period be spent in a leisurely inspection of the Industrial Finishing Exposition.

AND

The Plated-Ware Exhibit showing the results of application of old and new methods, also in Convention Hall.

OR

For those who are strangers to Atlantic City and the New Jersey shore, this afternoon will afford an opportunity to explore the city and surroundings. A booklet with description of Atlantic City will be furnished at the time of registration for your convenience.

8:00 P. M.

RESEARCH COMMITTEE MEETING, Room 106, Hotel Ambassador.

GENERAL PROGRAM

WEDNESDAY, JUNE 30, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

9:30 A. M. to 12:00 Noon

THIRD EDUCATIONAL SESSION, Convention Hall Ballroom, second floor. George P. Swift, Consultant, Boston, Mass., presiding.

1. *A Circulating Electrolyte Cell for Strip Plating Evaluation*
   R. A. Dimon, Carnegie-Illinois Steel Corporation
2. *Bright Barrel Plating of Nickel and Zinc*
   Leonard A. Chesworth, United-Carr Fastener Corporation
3. *Plating Copper-Zinc Alloys*
   A. Kenneth Graham, Graham, Crowley and Associates
4. *The Deposition of Metals on Plastics Employing Reduced Copper Films*
   Harold Narcus, Electrochemical Industries, Inc.

Abstracts of these Papers are found on pages 592–593.

2:00 P. M. to 4:30 P. M.

FOURTH EDUCATIONAL SESSION, Convention Hall Ballroom, second floor. Howard Woodward, Sundmark Supply Company, Los Angeles, Calif., presiding.

1. *Judging the Quality of Plated Parts*
   William M. Phillips and F. L. Clifton, General Motors Corporation
2. *Practical Methods of Cost Finding and Estimating on Metal Finishes*
   Adolph Bregman, Consultant
3. *The Spiral Contractometer, a New Instrument of the Measurement of Stress in Electrodeposits*
   Abner Brenner and Seymour Senderoff, National Bureau of Standards
4. *Engineering Planning in the Plating Room*
   S. M. Martin, United Chromium, Incorporated

Abstracts of these Papers are found on page 593.

8:00 P. M.

SPECIAL BUSINESS SESSION, Convention Hall Ballroom. President Kenneth M. Huston in the chair. Preliminary discussion of newly proposed Constitution and By-Laws.

THURSDAY, JULY 1, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

RESEARCH COMMITTEE BREAKFAST, Room 125, Hotel Ambassador.

9:30 A. M. to 12:00 Noon

FIFTH EDUCATIONAL SESSION—A. E. S. Research Reports, Convention Hall Ballroom, second floor. Louis Weisberg, Consultant, New York City, and Chairman, Research Directing Committee, presiding.

1. *Project 5.—Some Effects of Copper as an Impurity in Nickel Plating Solutions and Its Effect on the Salt Spray Resistance of Nickel and Chromium Deposits on Steel*
   D. T. Ewing and Robert Rominski
2. *Project 6.—Determination of the Porosity and Corrodibility of Electrolytic Metal Foils*
   N. Thon and D. K. Kelemen
3. *Project 7.—The Effect of Internal Stress on Thickness Determination by the Jet Method*
   Harold J. Read
4. *Project 9.—Physical Properties of Nickel Deposits*
   Abner Brenner and Charles W. Jennings

2:00 P. M.

FINAL BUSINESS SESSION, Convention Hall Ballroom. President Kenneth M. Huston in the chair.

7:00 P. M. to 1:30 A. M.

ANNUAL BANQUET, Renaissance Ballroom, Hotel Ambassador.
Dinner—Community Singing—Awards
Entertainment—Continuous Music for Dancing

TIME SCHEDULE FOR INDUSTRIAL FINISHING EXPOSITION

Monday, June 28—12:00 Noon to 10:00 P. M.

Tuesday, June 29—10:00 A. M. to 10:00 P. M.

Wednesday, June 30—10:00 A. M. to 10:00 P. M.

Thursday, July 1—10:00 A. M. to 5:00 P. M.

Admission free by Convention badge or by ticket furnished by Exhibitors or at Exposition Registration Booth

Ladies' Committee

WELCOME TO THE LADIES

THE Ladies' Committee extends a warm welcome to you, our guests in Atlantic City this summer. We have prepared a program for your entertainment which will keep you occupied and interested and still afford you an opportunity to engage in your favorite pursuits in America's famous Bagdad-by-the-Sea.

Atlantic City is a year-round resort, but in early Summer it is, indeed, a vacationist's paradise. Its warm sunny days, comfortably cool evenings, invigorating and salty ocean breezes whet the appetite and are conducive to complete relaxation.

We hope that you will tuck a pair of comfortable walking shoes into your traveling bag, because there are miles of excellent boardwalk, abounding in shops of the better kind, unusual displays of home furnishings, as well as bazaars. Those who over-extend themselves or wish to accelerate their sight-seeing will find the promenade replete with rolling chairs. Of course, if you plan to take a dip in the ocean or absorb the health-giving rays of the sun in a beach chair, you will want to have your bathing suit and a beach robe.

We, your hostesses, are eager that you enjoy your visit to our Convention City, and our plans have been made with this in view.

REGINA H. MUNNING, Chairlady
Ladies' Committee.

Regina (Mrs. A. P.) Munning
Chairlady, Ladies' Committee

Catherine (Mrs. H. H.) Smith
Co-Chairlady, Ladies' Committee

Jennie (Mrs. George) Wagner
Secretary, Ladies' Committee

Committee: Connie (Mrs. William F.) Bruhns, Agnes (Mrs. Samuel S.) Frey, Peggy (Mrs. John R.) Gumm, Frieda (Mrs. George) Klink, Alice (Mrs. William W.) McCord, Nina (Mrs. Charles Muller, Ruth (Mrs. Robert R.) Sizelove.

LADIES PROGRAM

SUNDAY, JUNE 27, 1948

3:00 P. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

The Registration Fee of $10.00 entitles registrant to a book of tickets that can be used for all functions and activities during the Convention. Registrants need not be members of the American Electroplaters' Society.

MONDAY, JUNE 28, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

3:00 P. M. to 5:00 P. M.

TEA will be served in the beautiful and spacious Upper Lounge of the Hotel Ambassador. An excellent opportunity to become acquainted.

8:30 P. M.

OPEN HOUSE, Renaissance Ballroom, Hotel Ambassador. Under the auspices of the International Fellowship Club.
Dancing—Buffet Lunch—Refreshments
All registrants are invited to attend.

TUESDAY, JUNE 29, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.
Morning open for personal activities.

1:00 P. M.

AUNT ELLA'S SOCIETY LUNCHEON PARTY, Embassy Salon, Hotel Ambassador. Sponsored by Oakite Products, Inc. D. X. Clarin, Secretary.
A grand affair, with an excellent meal and a surprise in the way of unusual entertainment.

Evening

The late afternoon and evening have advisedly been left open to allow you to visit the Industrial Finishing Exposition and to look over the city with its many attractions.

WEDNESDAY, JUNE 30, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

1:00 P. M.

LUNCHEON with music in the Trellis Room, Ritz-Carlton Hotel on the Boardwalk.
All ladies attending this luncheon will be presented with a keepsake.

8:00 P. M.

"PLATO" PARTY, 22 Club Room, Hotel Ambassador. Sponsored by the International Fellowship Club. Under the direction of Joan Trumbour Wiarda.
Prizes

THURSDAY, JULY 1, 1948

8:00 A. M.

REGISTRATION, Upper Lounge, Hotel Ambassador.

Morning and Afternoon

The morning and afternoon of the final day of the Convention have not been scheduled in order that you may enjoy yourself as a carefree vacationist. If you have not already done so, we suggest that you visit the Steel Pier on the Boardwalk. You will find a ticket in your passbook which will be honored any day during the Convention and which entitles you to all the facilities this interesting pier has to offer, including motion pictures, vaudeville, water circus, dancing, name bands, exhibits, etc.

7:00 P. M. to 1:30 A. M.

ANNUAL BANQUET, Renaissance Ballroom, Hotel Ambassador.
Dinner—Community Singing — Awards
Entertainment—Continuous Music for Dancing

NEWARK BRANCH OFFICERS 1948-1949

Zachary Irenas
President

B.S., Columbia University. Superintendent of Metal Finishing, General Instrument Corporation, Elizabeth, N. J.

Robert S. Herwig
First Vice-President

Ch.E., Newark College of Engineering Chief Engineer, Belco Industrial Equipment Division, Paterson, N. J.

Myron B. Diggin
Second Vice-President

B.S. 1926 and M.A. 1928, Wesleyan University. Technical Director, Harson-Van Winkle-Munning Company, Matawan, N. J.

George Wagner
Secretary-Treasurer

Past President, American Electroplaters' Society, 1943. Owner, Hy-Grade Electroplating Company, Newark, N. J.

Samuel S. Frey
Recording Secretary

M.S., University of Chicago, 1931. Research Chemist, Oakite Products, Inc., New York City.

Edwin R. Bowerman, Jr.
Librarian

B.S., University of Rochester, 1939; M.S Stevens Institute, 1947 Engineering Research Department, Sylvania Electric Products, Inc, Bay4ide, N.Y.

Albert E. Howe
Assistant Librarian

B.S., Massachusetts State College. Finishing Engineer, Air Conditioning Division, General Electric Company, Bloomfield, N. J.

Frank England
Sergeant-at-Arms

B.S., Norwich University. Foreman Plater, Curtiss Propeller Division, Curtiss Wright Corporation, Caldwell, N. J.

Horace H. Smith
Chairman,
Board of Managers

Past President, American Electroplaters' Society, 1929 and 1930. President, Surety Electroplating Company, Newark, N. J.

John L. De Vries
Member,
Board of Managers

B.S., Rutgers University, 1921. Sales Engineer, Oakite Products, Inc., New York City.

Howard Cobb
Member,
Board of Managers

Graduate, M. I. T., 1923. Engineer, Aircraft Radio Corporation, Boonton, N. J.

ABSTRACTS OF CONVENTION PAPERS

INDUSTRIAL ELECTROPOLISHING. *Charles L. Faust, Battelle Memorial Institute.*

Factors which influence the decision to use or not to use electropolishing will be discussed. Commercial experience with electropolishing of steel, stainless steel, brass, aluminum, and possibly silver will be cited. Actual cost data will be presented on direct charges for chemicals, labor, electricity, racks, etc., which can be extrapolated to the electropolishing of nickel and copper in the form of either plate or solid metal. The relationship of electropolishing to mechanical finishing prior to electroplating will be of interest, both from the standpoint of cost and technical advantages.

ELECTROPOLISHING SILVER IN CYANIDE SOLUTIONS. *Daniel Gray, Oneida, Ltd.*

The primary object of this paper is to give a complete description of a practical method of electropolishing silver in cyanide solutions, including make-up of baths, operating conditions, and effects of chemical and electrical factors. In addition, this paper will present in simple, non-mathematical language a theory of the mechanism of electropolishing and a definition of what constitutes an ideal metal to be polished. Stress will be placed on the economic implications of the process and on the wide open field for further research.

DIAPHRAGM TANKS TO ELIMINATE ROUGHNESS IN COPPER PLATING. *R. H. McCahan and C. E. MacKinnon, E. I. du Pont de Nemours & Company.*

A new method will be described for eliminating roughness of cyanide copper electrodeposits, which comprises the use of a relatively impervious canvas diaphragm separating anode and cathode compartments, continuous high-efficiency filtration from anode section to cathode section, and elimination of exposed metal surfaces in contact with the cathode electrolyte. By this method, combined with adequate solution circulation or work movement, smooth heavy plates may be obtained rapidly. Full operating details will be given.

OXIDATION OF TRIVALENT CHROMIUM IN CHROMIC ACID PLATING BATHS. *Robert Seegmiller and Vernon Lamb, National Bureau of Standards.*

In those chromium plating operations in which the anode area is necessarily restricted, the concentration of trivalent chromium tends to increase to objectionable values. A study will be presented of the effects of such factors as the concentrations of hexavalent and trivalent chromium and sulfate, temperature and current density, upon the rates of reoxidation of trivalent chromium. From these results, favorable conditions for this reoxidation can be defined.

DESCRIPTION, DESIGN AND PRODUCTION COSTS OF CONVEYORIZED SPRAY FINISHING SYSTEM. *E. Paul Schwartz, L. C. Smith-Corona Typewriter Corporation.*

The conveyorized spray finishing system to be discussed consists of spray-bonderizing for steel, aluminum and zinc parts, followed by a gas fired dry-off oven, water wash booths, and a gas fired baking oven. Details, such as temperatures, speeds, and solutions, will be included in the paper, and drawings, photographs, and a model of the system will be shown.

The steps covered in the design of the system are (1) preliminary studies, (2) layout, (3) specification of equipment. Under preliminary studies, the importance of production planning, tabulation of existing data, and a thorough study of methods of racking and handling will be stressed. The layout methods are to be described, and some of the problems involved will be discussed. Under specification of equipment, details of construction and ideas incorporated in the design are to be described, also troubles which may develop. Changes which were required after installation will be pointed out. These should be of interest to the designer of new equipment.

Complete data will be made available regarding cost of chemicals and labor used for cleaning and bonderizing. Data will be presented in chart form comparing labor costs of handling and spraying using trucks with conveyorized handling.

ABSTRACTS OF CONVENTION PAPERS

The Electroplaters Metals of the Future. *F. A. Lowenheim, Metal and Thermit Corporation.*

This paper is essentially a review of the work which has been reported on the electrodeposition of the "uncommon" metals. A rather thorough literature search has been made, and the salient features will be pointed out. More or less detail will be offered depending on the present state of the art. Thus the deposition of manganese, antimony and tungsten is to be considered in some detail, while such metals as tantalum and titanium, etc., will be mentioned only briefly.

The ground covered will be similar to that in Dubpernell's "Periodic Chart for Platers" (Proc. Am. Electroplaters' Soc., 1946), but the approach will be different, with more attention to actual details of the plating of the metals and less to an attempt to systematize the available information.

The Importance of Acid Ratio in the Phosphatization of Steel. *Nelson F. Murphy and Michael A. Streicher, Department of Chemical Engineering, Virginia Polytechnic Institute.*

A study will be presented of the effect of acid ratio, i. e., ratio of total to free acid contents, on the phosphatization of steel. It will be shown that the acid ratio may be accurately determined by using brom-phenol blue indicator in the free acid titration and phenolphthalein indicator in the total acid titration, and that the pH of the phosphatization solution is a function of the acid ratio in the concentration ranges studied.

Affected by the acid ratio are (1) the amount of sludge formed in the bath, (2) the formation of the hydrogen blanket on the piece during treatment, (3) the time required for formation of a satisfactory coating, (4) the quality of the coating, and (5) the loss or gain in weight of the treated piece. The change in weight during phosphatizing depends on the method of cleaning and the acid ratio.

Metal Cleaning. A Simple Test for A Clean Surface. *George B. Hogaboom, Consultant*

This paper will deal with the soils present on metals to be cleaned rather than with the cleaner itself, the effect of soils upon cleaners, and the best cleaners to be used with different soils. It is also intended to describe a simple test for surfaces that are both chemically and physically clean.

A Circulating Electrolyte Cell for Strip Plating Evaluation. *R. A. Dimon, Carnegie-Illinois Steel Corporation.*

The paper describes in detail two types of a circulating electrolyte cell which has been used extensively by the author to correlate tests on small batches of electrolyte with commercial strip plating operations in which the strip being plated is being moved through the electrolyte at a high rate of speed. In the cell the electrolyte is pumped between the anode and cathode at a speed corresponding to the corresponding rate of strip travel. The means used to control rate of circulation, temperature and current will be dealt with.

A resistance melting unit is to be described in which the melting conditions used in commercial tin plating lines are being duplicated, as well as a reflectometer by which the lustre of the strips is measured.

To illustrate the use of the equipment, data are given on the effect of such variables as solution flow, electrolyte temperature, tin and glue contents in the acid tin electrolyte described by Pine.

Bright Barrel Plating of Nickel and Zinc. *Leonard A. Chesworth, United-Carr Fastener Corporation.*

This paper will include a description of a barrel plating production unit for the plating of bright nickel on small parts to controlled thicknesses of up to 0.00075 inch which are to be chromium plated. The operating conditions, control methods, and purification procedure being used on a production installation will be detailed.

The paper will also describe a bright zinc barrel plating production unit which includes continuous electrolytic purification and a mechanical refrigeration system.

ABSTRACTS OF CONVENTION PAPERS

PLATING COPPER-ZINC ALLOYS. *A. Kenneth Graham, Graham, Crowley and Associates, Inc.*

This paper is a report on the electrodeposition of copper-zinc alloys from cyanide plating baths taken from an extensive investigation over a period of twelve years. The author will review the results of published work on this subject and compare them with the results of his investigation.

The paper will describe the deposition of copper-rich copper-zinc alloys and cover the various bronze colors of interest in metal finishing. These alloys can now be plated at relatively high current densities with excellent control of the composition.

THE DEPOSITION OF METALS ON PLASTICS EMPLOYING REDUCED COPPER FILMS. *Harold Narcus, Electrochemical Industries, Incorporated.*

A new practical method will be described for plating on non-conductive materials, especially on synthetic resins, employing reduced copper films in lieu of the presently used silver films. The advantages of the copper films over the silver films will be discussed in detail with particular reference to the quality of the plated plastic product, to the elimination of ever-present hazards encountered in the use of the more popular silver film, and to the economical aspects.

The necessary techniques, solutions and equipment used in practice to produce strongly adherent and continuous copper films capable of receiving a good subsequent electrodeposit will be discussed.

JUDGING THE QUALITY OF PLATED PARTS. *William M. Phillips and F. L. Clifton, General Motors Corporation.*

In pursuit of means to determine what constitutes quality of plated parts for various uses, the authors have for many years inspected parts from all makes of automobiles in many locations in the United States and determined the thickness of plate on the same parts of General Motors cars. The results of these studies will be presented in chart form. Interesting data from special roof tests will also be presented.

A new method developed to indicate the combined effect of stress-strain and brittleness will be demonstrated. The authors believe it of sufficient importance for inclusion in plating specifications.

PRACTICAL METHODS OF COST FINDING AND ESTIMATING ON METAL FINISHES. *Adolph Bregman, Consultant.*

Cost finding and estimating are the most important elements of the job- or contract-electroplater's business. They are complicated by the fact that most job platers do not have sufficient staff to analyze closely every one of the many jobs that they take in. So many jobs are in small lots that a complete breakdown might cost more than actually doing the work. Also, with the wide variety of work constantly moving through the shop it is extremely difficult to segregate costs in the plating room. This paper will describe methods developed in practice among job platers in the New York district. In most cases the figures will be based upon cost of labor, but they also will include tank-hour and barrel-hour, with due allowance for the cost of special materials such as precious metals, expensive non-metallic coatings, etc.

THE SPIRAL CONTRACTOMETER, A NEW INSTRUMENT FOR THE MEASUREMENT OF STRESS IN ELECTRODEPOSITS. *Abner Brenner and Seymour Senderoff, National Bureau of Standards.*

In this paper will be described a new instrument for the measurement of stress in electrodeposits. The instrument is designed for use either in research or in routine testing. In the process of evaluating the instrument, measurements of stress in nickel plates and other deposits were made and will be discussed.

Formulas for the calculation of stress will be derived, and a detailed discussion of the various formulas previously suggested included. The formulas most frequently used are to be compared and correlated, and the limits of applicability of each given.

ENGINEERING PLANNING IN THE PLATING ROOM. *S. M. Martin, United Chromium, Incorporated.*

A general resume of engineering applied to layout and equipment in the plating room will be given, covering essential points to be considered when planning new plating room installations or revising or expanding existing facilities. Such items as layout, floor drains, tank ventilation, solution temperature control, equipment maintenance and safety will be discussed.

PLATED-WARE BRANCH EXHIBITS

ONCE a year, the plater's handiwork is brought to public view in the form of a well-organized and clearly described exhibition of plated ware. All Branches of the Society compete for the honor of having been selected as the Branch with the best exhibit.

Here in Atlantic City, the Newark Branch, host to your Convention, has decided that the Branch Exhibits shall be displayed in a place of prominence as befits its importance. Therefore, we have selected Convention Hall, which also houses the Industrial Finishing Exposition, as the logical place.

A hearty and sincere greeting awaits every visitor whose curiosity is aroused. Having seen the industrial equipment and supplies required for metal finishing, he will find at the Branch Exhibits the ultimate result obtained.

The Committee for Branch Exhibits extends its warm thanks to all Branches whose cooperation is making this truly interesting Exhibit possible.

Louis J. Donroe, Chairman,
Plated-Ware Branch Exhibit.

INDUSTRIAL FINISHING EXPOSITION

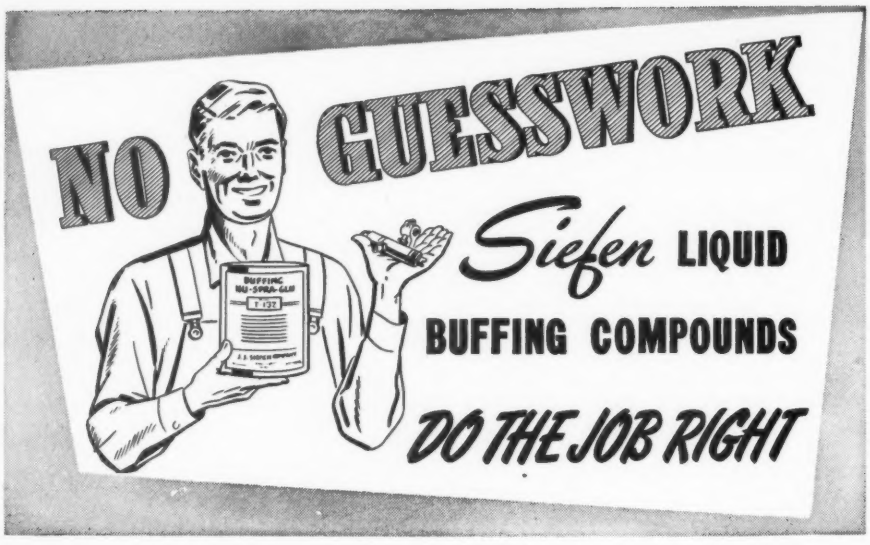
Atlantic City, June 28th - July 1st

OF THE two poles of the magnet, the Technical Sessions and the Industrial Finishing Exposition, which will attract the key figures of industry to the Convention of the American Electroplaters' Society this June, the Exposition will hold special interest.

Held in the Convention Hall in Atlantic City, the Exposition promises to be outstanding and unique in that practically all of the displays are of comparable size, featuring the widest possible range of products, processes and equipment, many in operation, of a hundred and more suppliers in the cleaning, plating, lacquering, polishing, buffing, filtering, tumbling, and allied fields.

This is an exposition you cannot afford to miss. Purchasing agents, manufacturing executives, operating and processing engineers, plant supervisors, and technicians will all concentrate here to be introduced to and to investigate developments which will make for better economy and quality. It will, indeed, be a spectacle worthy of your time and interest.

George Wagner, Chairman,
Industrial Finishing Exposition Committee.



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LIST OF EXHIBITORS

Acme Manufacturing Company, 1645 Howard Street, Detroit 16, Mich. Booths 52–54.

Exhibiting: Automatic polishing and buffing machinery.

In attendance: Glen A. Carlson, George R. Carlson.

A. E. S. Research Committee, 473 York Road, Jenkintown, Pa. Booths 19–20.

Allied Research Products, Inc., 4004 E. Monument Street, Baltimore 5, Md. Booth 131.

Exhibiting: Iridite.

In attendance: H. C. Irvin, President; A. L. Poe, District Sales Manager.

Almco, Division Queen Stove Works, Inc., 902–910 Marshall Avenue, Albert Lea, Minn. Booth 69.

Alpha Metals, Inc., 363 Hudson Avenue, Brooklyn 1, N. Y. Booth 16.

Exhibiting: Anodes.

In attendance: Harold Shonberg, President; Martin A. Boyle, Sales Manager.

Alsop Engineering Corporation, 306 Fine Street, Milldale, Conn. Booth 51.

Exhibiting: "Sealed-Disc" Filters for plating solutions and "Disc-Paks" Filters for water in operation; portable mixers and Speed-O-Plates.

In attendance: S. Alsop, Sr., President; S. Alsop, Jr., C. E. Crowley, and W. W. Freystedt, Vice-Presidents; J. J. O'Shea, Mixer Division.

American Buff Company, 2414 S. La Salle Street, Chicago 16, Ill. Booths 170–171.

Exhibiting: Buffs and polishing wheels, plating tanks and lathe in operation.

In attendance: Harry Pink, Service Engineer; Ernest Reichenberg, H. J. Sandstrom, and E. W. Hoyle, Sales Engineers.

American Chemical Paint Company, Ambler, Pa. Booth 106.

Exhibiting: "Alodine", corrosion-proofing and paint-bonding chemical for aluminum; "Duridine", cleaning and phosphate-coating chemical for sheet steel; "Granodine", zinc phosphate coating chemical for sheet steel; "Thermoil-Granodine", rust-proofing phosphate coating chemical for iron and steel; "Zinodine", corrosion-preventive and paint-bonding chemical for zinc and cadmium, "Rodine", pickling acid inhibitors.

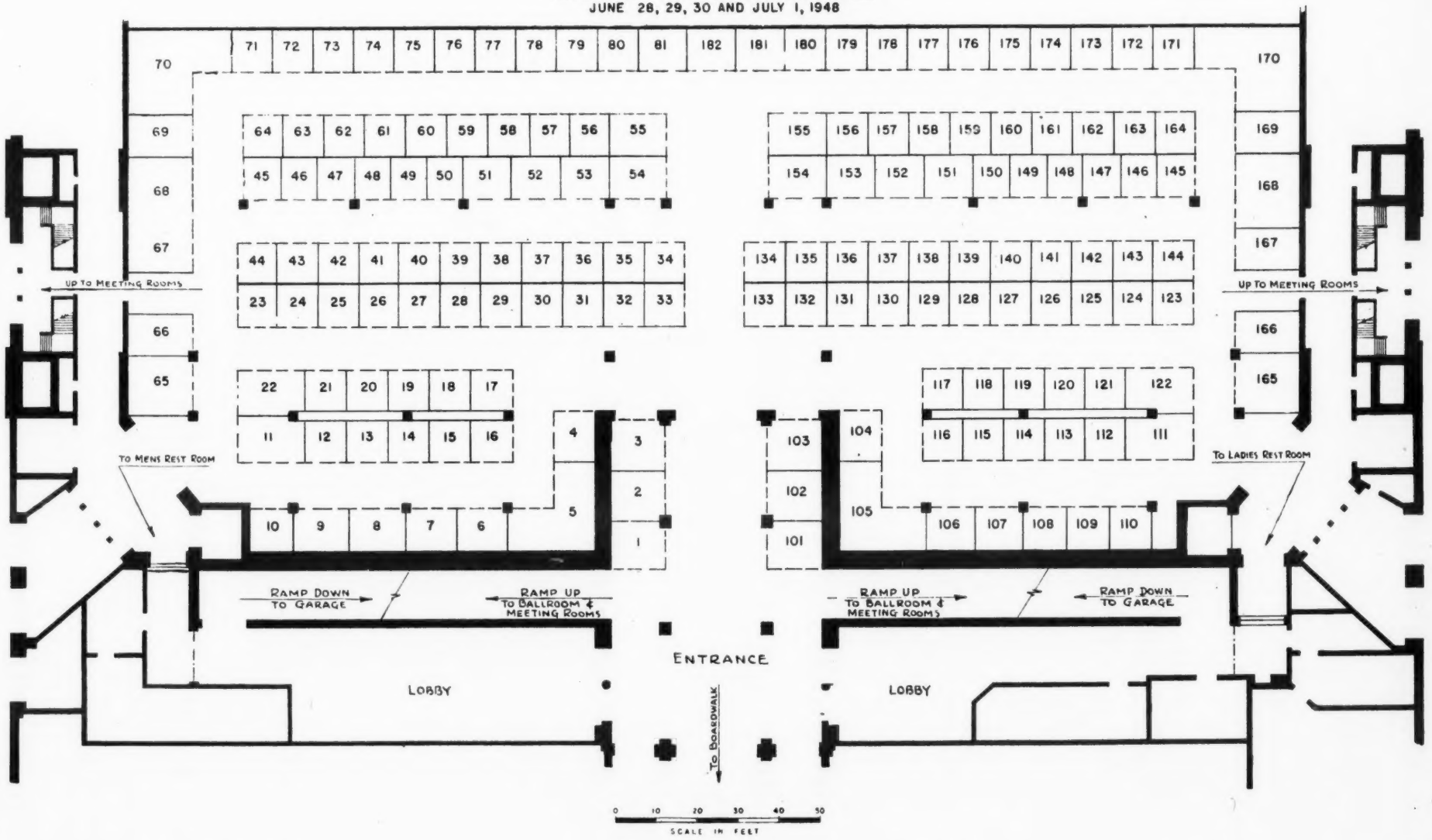
In attendance: F. P. Spruance, Jr., Alfred Douty, Joseph Mazia, James Thirsk, R. O. Bailey, N. P. Gentieu, W. B. Boyer, F. P. Spruance.

INDUSTRIAL FINISHING EXPOSITION

OF THE AMERICAN ELECTROPLATERS' SOCIETY

ATLANTIC CITY CONVENTION HALL

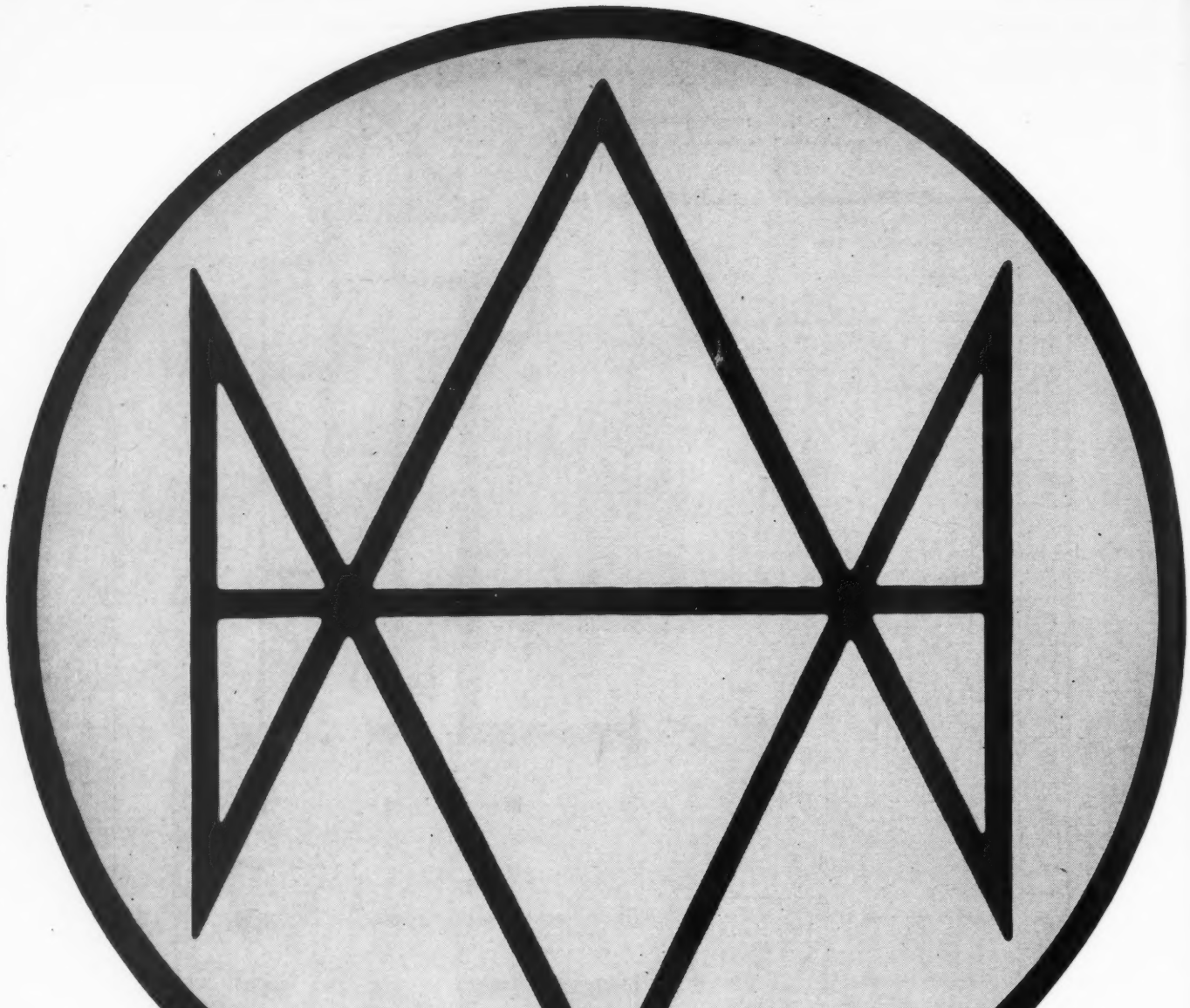
JUNE 28, 29, 30 AND JULY 1, 1948



Monday, June 28
12:00 Noon to 10: P. M.

Tuesday, June 29 and Wednesday, June 30
10:00 A. M. to 10:00 P. M.

Thursday, July 1
10:00 A. M. to 5 P. M.



Visit H-VW-M Headquarters, Ambassador Hotel as well as H-VW-M Exhibit, Booth No. 5, Convention Hall, at the A. E. S. Convention, Atlantic City, N. J., June 28—July 1, 1948.

EXHIBITORS

American Instrument Company, Inc., 8020–8030 Georgia Avenue, Silver Spring, Md. Booth 17.

Exhibiting: Magne Gage, Composite-coating Magne Gage, electric tank heaters and controls, Coleman Universal Spectrophotometer, Filmeter, Macbeth Line-operated *p*H Meter.

In attendance: Louis R. Heiss, Salesman.

Automotive Rubber Company, Inc., 8601 Epworth Boulevard, Detroit 4, Mich. Booth 154.

Exhibiting: Tanks, racks, diaphragm systems, anode containers, dipping baskets, utensils, material-handling screen, tank grids, pipe, air agitation systems, etc.

In attendance: R. L. Redmond, Sales Manager; F. D. Wressel, C. A. Petoskey, and W. C. Enright, Sales Engineers.

Bart-Messing Corporation, 45 Morgan Avenue, Brooklyn 6, N. Y. Booths 119–120.

Exhibiting: New selenium rectifiers for electroplating.

In attendance: Robert Corey and Benjamin Flug, Assistant Sales Managers; Edwin C. Rinker, New Jersey Regional Sales Manager; M. M. Messing, President; S. G. Bart, Secretary-Treasurer; E. R. Redlhammer, Chief Engineer.

Beacon Wiper Supply Company, 110–156 Marginal, Chelsea, Mass. Booth 15.

Exhibiting: Buffing wheels.

In attendance: Max Feinberg, President; A. N. Farnham, Vice-President.

Behr-Manning Corp., Troy, N. Y. Booths 155–156.

Exhibiting: Coated abrasive belts, contact wheels and idler backstands.

In attendance: M. I. Jackson and A. F. Lehnhardt, Divisional Sales Managers; K. T. Obeck, J. Durnam and H. Real, Products Engineers; H. J. Howe, Assistant Sales Promotion Manager.

Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill. Booths 38–39.

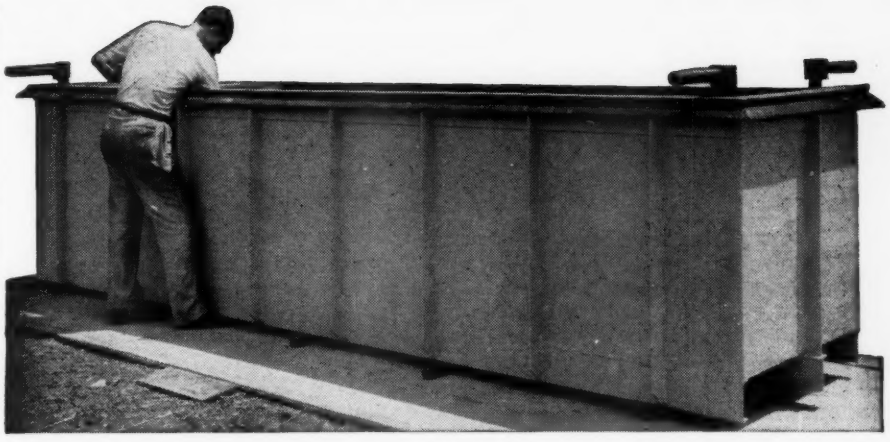
Exhibiting: Plating racks, equipment, and supplies.

In attendance: William E. Belke, President; Harvey J. Johnson, Vice-President; Edward O. Staneck and Raymond W. Kotz, Technical Representatives.

G. S. Blakeslee & Company, 1844 S. 52nd Avenue, Chicago 50, Ill. Booths 162–163.

Exhibiting: Metal parts washers, several solvent vapor degreasers in operation.

In attendance: R. B. Thompson, I. F. Snow and R. Kendall, Sales Engineers.



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THE Pyroflex constructed tank above was built for pickling stainless steel in a solution of nitric and hydrofluoric acids.

Many other corrosion-proof tanks have been built for acid storage, sulphuric acid pickling, acid rinsing or washing. Knight engineers designed these Pyroflex Units using the materials best suited for each service condition.

Pyroflex Fume Washers

The Pyroflex Fume Washer below was designed by Knight engineers for roof installation and is being used for removing HC1 fumes from vent gases. Similar successful Pyroflex Units are in service for other corrosive acid fumes, elimination or suppression of oil and acid mists and for removing dust from gases.

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G-C Brand
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($Na_2O.2SiO_2$) Anhydrous Silicate. Slowly soluble. Ground to pass 65 mesh.

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EXHIBITORS

Buckingham Products Company, 14100 Fullerton Avenue, Detroit 27, Mich. Booths 179–180.

Exhibiting: Polishing and buffing compositions.

In attendance: R. M. Buckingham, President and General Manager; H. J. Patterson, Lex Winans and Joe Davis, Salesmen; L. M. Ring, District Sales Manager, Pittsburgh, Pa.

The Chemical Corporation, 54 Waltham Avenue, Springfield, Mass. Booth 116.

Exhibiting: Luster-on bright dip for zinc-plated surfaces, stripode addition agent for nickel stripping, Never-Sever Solder Flux for passivated zinc.

In attendance: K. P. Bellinger, Vice-President; B. H. Gardner, Advertising Manager; Leo Arsenault, Howard Hancock, William Lindsey.

Chromium Engineers, Inc., 2636 S. Michigan Avenue, Chicago 16, Ill. Booth 41.

Colonial Alloys Company, Technical Process Division, Ridge Avenue and Crawford Street, Philadelphia 29, Pa. Booth 145.

Co-Operative Industries, Inc., 100 Oakdale Road, Chester, N. J. Booth 151.

Commercial Filters Corporation, 18 W. 3rd Street, Boston 27, Mass. Booth 166.

Exhibiting: Fulflo filters of steel, stainless steel, and rubber-lined steel, with Honeycomb Filter Tubes for continuous filtration of individual acid or alkaline plating tanks at flow-rates up to 14,000 gallons per hour.

In attendance: E. W. Sherburne, Director of Field Sales; representatives of New York Office and of the J. V. Calhoun Company, 349 Montgomery Avenue, Bala-Cynwyd, Pa.

Crown Rheostat & Supply Company, 3465 N. Kimball Avenue, Chicago 18, Ill. Booths 60–61.

Exhibiting: Plating equipment.

In attendance: C. E. Clindinin, G. E. Haenerfauth, and Fred P. Green.

Daniels Plating Barrel & Supply Company, 129 Oliver Street, Newark 5, N. J. Booth 104.

Darco Corporation, 60 E. 42nd Street, New York 17, N. Y. Booth 27.

Exhibiting: Red Label Darco S-51 for maintenance of purity of electroplating solutions.

In attendance: W. A. Helbig, Chemical Engineer.

EXHIBITORS

Detrex Corporation, P. O. Box 501, Detroit 32, Mich. Booths 67–68.

Die Castings Magazine (The Technical Publishing Company), 1240 Ontario Street, Cleveland 13, Ohio. Booth 21.
Exhibiting: Publications.
In attendance: Jerome R. Peskin, General Manager; David W. Veit, Editor.

Diversey Corporation, Metal Industries Department, 53 W. Jackson Boulevard, Chicago 4, Ill. Booths 30–31.
Exhibiting: Diversey 909 soak tank cleaner demonstrated.
In attendance: B. B. Button, Manager; D. F. Seymour, F. C. Wagner, W. Laletin, L. C. Hesoun, C. G. Smith, R. L. Shannon, A. J. Wurster, L. J. Moyes, R. J. Stell.

Divine Brothers Company, 200 Seward Avenue, Utica 1, N. Y. Booths 25–26.
Exhibiting: Buffing and polishing wheels, machinery, and accessories.
In attendance: Robert L. Klaas, Vice-President; A. M. Brown, Commercial Manager; Charles J. Lamb, Assistant Sales Manager; William C. Beddoe, Advertising Manager; A. C. Hitzelberger, T. R. Treadwell, H. W. Fish, L. E. Sullivan, R. A. Bantham, C. S. Johnson, J. Warren, H. J. Breithart, F. H. Thompson, Sales Personnel.

Duggan Masking Devices, 2030 W. Fort Street, Detroit 16, Mich. Booth 35.
Exhibiting: Plating racks, electroformed paint masks, stop-off masks.
In attendance: David Riseman, President; Val Jones, Sales Manager.

Duluth Buff Company, 2420 S. La Salle Street, Chicago 16, Ill. Booth 141.
Exhibiting: Buffs and polishing wheels.
In attendance: Murray Paley and Morris Katz, Sales Engineers.

Electric Products Company, 1725 Clarkstone Road, Cleveland 12, Ohio. Booths 36–37.
Exhibiting: Motor-Generators for electroplating and other electrolytic processes.
In attendance: Gordon S. Berry, Vice-President and Sales Manager; Robert J. Peck, New York District Manager; C. L. Leaf, New York Office; Rober G. Redhead, Advertising Counsel.

Enthone, Inc., 442 Elm Street, New Haven 2, Conn. Booth 22.
Exhibiting: Processes for blackening metals, plating on aluminum, stripping enamels and cleaning of metals.
In attendance: Dr. Walter R. Meyer, President and Technical Director; J. F. Buckman, Vice-President; C. C. Helmle, Secretary; Hubert M. Goldman, Chemical Engineer; William Porter, Development Chemist; Joseph R. Eisele, Derick S. Hartshorn, Jr., A. H. Sanders, Austin Fletcher, Raymond Goral and John J. Lippoth, Sales Engineers.

Finishing Publications, Inc., 11 W. 42nd Street, New York 16, N. Y. Booth 29.
Exhibiting: Copies of Metal Finishing, Organic Finishing and books.
In attendance: P. H. Langdon, Assistant Publisher; T. A. Trumbour, Business Manager; J. I. Wiarda, Advertising Manager; Walter A. Raymond, Engineering Editor; F. C. Wehrman, Eastern Manager; J. E. Trumbour, News Editor.

Formax Manufacturing Corporation, 12934 Evergreen Road, Detroit 23 Mich. Booth 122.
Exhibiting: Buffing and polishing wheels and compounds, abrasive belt backstand idler units in operation, anode bags, spray guns and equipment for application of liquid buffing compounds in operation.
In attendance: H. J. McAleer, President; E. W. McAleer, Vice-President; E. D. McAleer, Sales Manager; J. J. McAleer, Secretary-Treasurer; R. B. Holmes, Lewis A. Feldenkris and G. A. Meyers, Sales Representatives; Stuart Rodgers, Sales Department.

Gardner Publications, Inc., 431 Main Street, Cincinnati 2, Ohio. Booths 42–43.
Exhibiting: Copies of Products Finishing.

General Chemical Division, Allied Chemical and Dye Corporation, 40 Rector Street, New York 6, N. Y. Booth 40.

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EXHIBITORS

Exhibiting: Industrial, laboratory and electroplating chemicals.

General Electric Company, 1285 Boston Avenue, Bridgeport, Conn. Booths 12–13.

Exhibiting: Rectifiers for electroplating.

In Attendance: N. A. Searles, R. V. Dawney, G. C. Ruckel, E. R. Broughel, D. M. Daley, R. D. Link, Tungar and Metallic Rectifier District Representatives; R. D. Amsden, Rectifier Division Engineer; I. A. Lee, Sales Manager, Special Rectifier Sales.

Walter C. Gold, Inc., 216 S. Front Street, Philadelphia 6, Pa. Booths 177–178.

W. Green Electric Company, Inc., 130 Cedar Street, New York 6, N. Y. Booth 62.

Exhibiting: Rectifiers.

In attendance: L. W. Reinken, Chief Engineer; E. I. Huppert, Jr., Sales Manager; James D. Trehy, Assistant Sales Manager.

Gumm, Frederick, Chemical Company, Inc., 538 Forest Street, Kearny, N. J. Booths 132–133.

Hammond Machinery Builders, Inc., 1600 Douglas Avenue, Kalamazoo, Mich. Booths 142–144.

Exhibiting: Rotary automatic polishing and buffing machines, polishing lathes, cylindrical finishing machines, abrasive belt backstands, abrasive belt grinder, polishers, all in operation.

In attendance: Lee Hammond, President; S. H. Miller, Sales Manager; H. J. Kingsbury, Chief Engineer; Ramsay Bell, Methods Engineer; M. Bass, Engineer.

Hanson-Van Winkle-Munning Company, Church Street, Matawan, N. J. Booth 5.

Exhibiting: Electroplating equipment and supplies.

In attendance: Edmund H. Hanlon, Equipment Sales Engineer, and Martvig J. Moll, Chief Conveyor Sales Engineer, in charge.

Haveg Corporation, Newark, Del. Booth 118.

Exhibiting: Plating and pickling tanks, fume hoods, fans, pipe, valves, fittings, and electrical insulating materials, made of non-corroding plastics.

In attendance: C. R. Runk, Sales Manager; J. W. Carrow, George B. Allen and H. B. Haney, District Sales Engineers.

R. O. Hull & Company, Inc., 1279 W. Third Street, Cleveland 13, Ohio. Booth 45.

Industrial Electroplating Company, Inc., 219 W. Vermont Street, Indianapolis 4, Ind. Booth 11.

Exhibiting: Niehaus fume separator and Niehaus dust separator.

In attendance: Carl Niehaus, President; William G. Niehaus, Vice-President.

Industrial Filter and Pump Manufacturing Company, 1621–1639 W. Carroll Avenue, Chicago 12, Ill. Booth 65.

Exhibiting: Demonstrator filter of lucite in operation, production filter, salt-fog test cabinet.

In attendance: Jack F. Brossart, Sales Manager; Harold W. Faint, Morton Van Loan and John R. Miller, Sales Representatives.

International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y. Booths 79–81.

Exhibiting: "Seeing Is Deceiving," a fascinating modernistic display of startling optical illusions, is combined with an exhibit of tests and controls: meters, gauges, *p*H indicators, filters, and other testing instruments used in the laboratory and in the shop to assure quality workmanship.

In attendance: George Black, Publicity Section; Robert J. McKay, Walter H. Prine and Clarence H. Sample, Plating Section.

Iron Age, 100 E. 42nd Street, New York 17, N. Y. Booth 34.

Jackson Buff Corporation, 21–03 41st Avenue, Long Island City, N. J. Booths 102–103.

Kocour Company, 4800 St. Louis Avenue, Chicago 32, Ill. Booth 18.

Exhibiting: Testing equipment.

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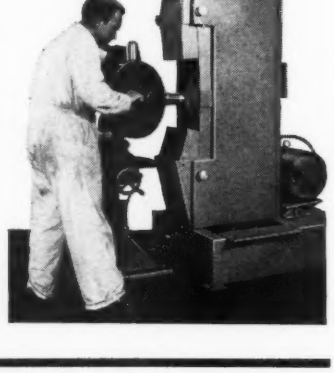

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EXHIBITORS

Lasalco, Inc., 2818–2838 La Salle Street, St. Louis 4, Mo. Booths 181–182.

Exhibiting: Daw Junior Full Automatic Plating Conveyor.

In attendance: B. G. Daw, President and Treasurer; H. J. Struckhoff, Vice-President and Sales Manager; A. G. Bignall, Sales Engineer.

Lea Manufacturing Company, 16 Cherry Avenue, Waterbury 86, Conn. Booths 32–33.

Exhibiting: Lea Compound, Learok, Ad-Lea-Sive, Mirror-Glo, Nickel-Glo, Lea-Clad Bright Cadmium Process, analytical sets, abrasive belts.

In attendance: R. S. Leather, President; R. P. Crane and E. W. Couch, Vice-Presidents; H. L. Kellner, Technical Director; E. T. Candee, Chief Chemist.

L'Hommedieu, Charles F. & Sons Company, 4521 Ogden Avenue, Chicago 23, Ill. Booth 55.

Exhibiting: Reliance Variable Speed Lathes, Reliance Plating Barrels, Reliance Rheostats, Reliance Buffs and Buffing Composition.

In Attendance: C. B. Little, Eastern Representative; John E. Brown, Sales Engineer.

Magnaflux Corporation, 5900 Northwest Highway, Chicago 31, Ill. Booth 126.

Magnus Chemical Company, Inc., South Avenue, Garwood, N. J. Booths 158–159.

Matchless Metal Polish Company, 840 W. 49th Place, Chicago 9, Ill. Booths 152–153.

Midwestern Manufacturing Co., 175 Fifth Avenue, New York, N. Y. Booth 172

Minnesota Mining and Manufacturing Company, 900 Fauquier Avenue, St. Paul, Minn. Booth 70.

Munning & Munning, Inc., 202 Emmett Street, Newark 5, N. J. Booths 63–64.

Exhibiting: Plating barrels, tumbling barrels, agitators, glue stands, buffing compounds.

In attendance: A. P. Munning and J. A. Munning, Vice-Presidents; W. W. McCord and R. T. Gore, Sales Engineers; W. J. Wilbur, Chief Engineer; B. M. Fletcher, Purchasing Agent.

Gripmaster Division, Nelson Chemicals Corporation, 12345 Schaefer Highway, Detroit, Mich. Booth 149.

Exhibiting: Gripmaster polishing wheel cement.

In attendance: Morie Nelson, G. R. Smith, James Ritchie.

Oakite Products, Inc., 22 Thames Street, New York 6, N. Y. Booths 127–128.

Optimus Equipment Company, Matawan, N. J. Booth 4.

Panoco Division, Paper Novelty Manufacturing Company, 505 Carroll Street, Brooklyn 15, N. Y. Booth 121.

Exhibiting: Die-cut masking tape.

In attendance: Millard Pretzfelder, Jr.

Pennsylvania Salt Manufacturing Co., Special Chemicals Division, 1000 Widener Building, Philadelphia 7, Pa. Booths 136–137.

Exhibiting: "Pennsalt" metal cleaners, acid proof cements, corrosion resistant paints.

In attendance: J. J. Duffy, Jr., Manager of Sales; A. H. Clem, Field Sales Supervisor; V. A. Curll, Technical Supervisor; P. C. Staples and R. R. Pierce, Product Supervisors; W. J. Hennessy, District Sales Manager; H. F. McIntyre Philadelphia Representative; W. D. Wilson, Newark Representative.

Plating Magazine, 473 York Road, Jenkintown, Pa. Booth 66.

In attendance: A. R. Putnam, Advertising Manager.

Plating Products Company, 352 Mulberry Street, Newark 2, N. J. Booth 24.

Porter-Cable Machine Company, 1714 N. Salina Street, Syracuse 8, N. Y. Booths 129–130.

Republic Industries, Inc., 1040 W. Fort Street, Detroit 26, Mich. Booth 149

Exhibiting: Buffing wheels.

In attendance: J. J. Marx, President; E. A. Wolf, Jr., Vice-President and Treasurer.

The Reynolds-Robson Supply Company, 2213–2221 W. Glenwood Avenue, Philadelphia 32, Pa. Booth 157.

Unichrome Coating 218 delivers record service on rack

A WELL-KNOWN MANUFACTURER gave Coating 218 their most severe practical test—protecting a rack in their lead plating bath. The solution operates at about 220°, contains nearly 27 ounces of caustic per gallon. Yet even after *8 months* of this, Coating 218 shows only slight loss of resilience, is still as smooth as the day it was put on the rack. Former rack coatings were wrecked *within 2 weeks!*

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THE HILL ELECTRIC COMPANY 560 Mateo Street, Los Angeles 13, Calif.
LEA PRODUCTS COMPANY 261 Queens Street, Montreal, Canada
CARL BUCK AND ASSOCIATES 1311 Widener Bldg., Philadelphia 7, Pa.

EXHIBITORS

In attendance: W. A. Reynolds and D. R. Robson, Partners; C. E. Boerckel and T. Morgan, Jr., Sales Engineers.

James H. Rhodes & Company, 157 W. Hubbard Street, Chicago 10, Ill. Booth 28.

Exhibiting: American-ground Italian powdered pumice stone, light-weight No. 718 lump pumice, felt, abrasives.

In attendance: John E. McCutchen, Vice-President in Charge of Production; A. N. Sudduth, Vice-President; Lincoln Knecbone, General Sales Manager; J. J. Marr, Assistant Sales Manager.

Ronci Machine Company, 2 Atlantic Boulevard, Centredale 11, R. I. Booth 140.

Sparkler Manufacturing Company, Lake Street, Mundelein, Ill. Booth 23.

Exhibiting: Rubber-lined plating equipment for acid plating bath, all-iron filter for cyanide baths, spare plates to show plate detail, filter media; some equipment in operation.

In attendance: K. L. Carr, Sales Manager; G. C. Garland, R. E. Shields and J. C. Sharbaugh.

Special Chemicals Corporation, 39 Irving Place, New York 3, N. Y. Booth 9.

Standard Electrical Tool Company, 2488–2496 River Road, Cincinnati 4, Ohio. Booth 101.

Exhibiting: Infinitely-variable-speed buffing and polishing lathes from 1 to 20 hp in operation.

In attendance: W. A. Ferguson, President; Jack J. Falls, Vice-President; Ray A. Huhn, Secretary; Joseph J. Klopp, Treasurer; L. Menke, Foreman; W. J. Holtmeier and F. W. Larson, Representatives.

Standard Plating Rack Company, 1925 N. Paulina Street, Chicago 22, Ill. Booth 117.

Frederic B. Stevens, Inc., 1800 18th Street, Detroit 16, Mich. Booths 57–58.

Sturgis Products Company, 203 Jacob Street, Sturgis, Mich. Booth 164.

Exhibiting: Roto-Finish and other mechanical finishing equipment, display of parts before and after Roto-Finishing.

In attendance: C. H. Castle, Technical Director; D. T. Barrett, President; L. W. Evans, Eastern Factory Representative.

Sylvania Plastics Company, 5520 S. Main Street, Sylvania, Ohio. Booth 44.

Titeflex, Inc., 500 Frelinghuysen Avenue, Newark 5, N. J. Booths 77–78.

Exhibiting: Industrial filters, flexible metal tubing.

In attendance: H. T. Lord, Sales Manager, Filter Department; B. W. Lerner, Assistant Sales Manager, Filter Depart-

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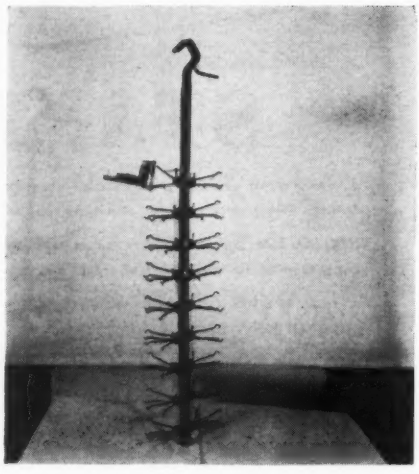

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ment; Harry Forster, Metal Tubing Department.

H. O. Trerice Company, 1420 W. Lafayette Boulevard, Detroit 16, Mich. Booth 138.

Exhibiting: Industrial engraved stem, dial and recording thermometers; temperature controllers in operation; pressure regulators and gauges; steam traps in operation; air filters and air guns.

In attendance: James Leslie, New York Branch Manager; J. L. Brackett, Chief Engineer; E. L. Myers, F. Z. Dahn.

Udylite Corporation, 1651 E. Grand Boulevard, Detroit 11, Mich. Booths 167–169.

United Chromium, Inc., 51 E. 42nd Street, New York 17, N. Y. Booths 123–125.

Exhibiting: Anozine; Unichrome rack coatings, lacquers and synthetics; Unichrome copper, and dips for zinc and cadmium; Ucilon protective coatings; chromium technical assistance.

In attendance: H. D. McLeese and T. G. Coyle, Vice-Presidents; E. N. Riotte, Manager New York District; M. Shacat, Manager New England District; R. H. Dudley, Manager Detroit District; R. J Wooley, Manager Los Angeles District, L. A. Critchfield, Manager Dayton District; V. C. Burr, F. Fulforth, G. Ashworth, G. E. Vibberts, T. A. Ayr, D. E. Hartman.

U. S. Control Laboratories, Inc., P. O. Box 289, Red Bank, N. J. Booth 48.

U. S. Stoneware Company, Akron 9, Ohio. Booths 71–73.

Exhibiting: Tank linings, rack coating materials, Tygon paint, lead anodes.

In attendance: Howard Farkas, Vice-President; Sidney Lewis, A. C. Coffman, L. E. Wybel, Walter Webb, Russell Fancher.

Wagner Brothers, Inc., 400 Midland Avenue, Detroit 3, Mich. Booths 134–135.

Exhibiting: Wagner-Tiedeman rectifiers, Flat-Top zinc anodes.

In attendance: O. H. Tiedeman, Chief Engineer; Bill Ross and Fred Wagner, Vice-Presidents; Joe Wagner, President.

Waverly Petroleum Products Company, Drexel Building, Independence Square, Philadelphia 6, Pa. Booth 139.

Exhibiting: Troxide pickling compound and Protectofoam, used to replace conventional acids in removing scale and rust from metals.

In attendance: George E. Willey, President; Edward P. Frankel, General Manager; T. F. O'Brien, Manager, Troxide Division; Edw. W. Coogan and Franklin A. Miller, Field Engineers.

Wico Metal Products Company, 23142 Sherwood Avenue, P. O. Box 145, Van Dyke, Mich. Booth 114.

ANNUAL REPORTS OF OFFICERS OF THE AMERICAN ELECTROPLATERS' SOCIETY

PRESIDENT'S REPORT

Huston

Last June when the assembled Delegates conferred on me the honor of President of this Society, I was fully aware of the magnitude of the task made necessary by the high standards of administration set by my immediate predecessors.

Many of the aims of a President of the Society cannot be attained during one year's tenure of office. For this reason, the work of the President actually represents work of the Executive Board. Through its functioning, the long range aims of the Society are continued until they become a reality. An example of this is our new monthly journal PLATING which grew up with the January, 1948 issue. This change has been in progress since 1945.

This report, therefore, is the report of the Executive Board which has worked diligently and aggressively to conduct the business of the Society. I wish to take this opportunity to express my appreciation to the other members of the Executive Board for the cooperative spirit exhibited during the past year. Each officer has attended every Executive Board meeting. In the interest of economy, the number of Board meetings between Conventions was reduced to two, and, again for economy reasons, both were held in Philadelphia.

One of the most important items of business this year assigned to the Executive Board at the Detroit Convention was that of Constitution Revision. In accordance with the instructions of the Delegates, a committee consisting of Art Logozzo (Hartford Branch), as Chairman, Franklyn MacStoker (New York Branch), Frank Keller (Pittsburgh Branch), Cleve Nixon (Detroit Branch) and Clyde Kelley (Chicago Branch) was appointed to prepare a draft of a revised Constitution. Each member was assigned the responsibility of contacting definite Branches. Therefore, every interested Branch is represented in the revision. The Chairman provided each member of the committee with a draft of the present Constitution which included all amendments passed since the last printing. The individual Branches then were requested to submit what they desired to be included in the revision. This information served as a basis for the revised Constitution as printed in PLATING. How well it suits you, as Branch representatives, will be decided at the Wednesday evening meeting.

The expansion of Educational Courses related to the finishing of metals was another important aim on which progress was noted during the year. The Research Committee offered assistance which is resulting in the preparation of an outline to be followed in setting up courses at the trade school level. They were set up at that level first because it was believed they were needed there most. The long range program is to follow this step with metal finishing courses in colleges.

This important function is in urgent need of visual aids, such as slides and motion picture films useful in demonstrating finishing operations and processes. A list of available commercial films suitable for this purpose has been prepared by the Educational Chairman, but we need more films similar to the two educational films which will be shown during the Convention. Their preparation will be dependent upon your desires and the availability of funds.

Our cooperation with other technical societies was furthered by definite plans to appoint a liaison member from the Electrochemical Society to our Research Committee. The American Society for Testing Materials has had a liaison member on that committee for some time. Our relations with the Electrodepositors' Technical Society were continued. Two of our members presented papers at the Third International Conference on Electrodeposition held in London under its auspices. We have made preliminary plans, at its request, to hold the Fourth International Conference in connection with the 1950 Convention in Boston.

Strides were made during the year in establishing a file of the monthly publication of our Society in each Branch city. Eighteen libraries now have a more or less complete file of THE MONTHLY REVIEW, PLATING, and the *Proceedings*. Many of these libraries are equipped to supply photostatic copies of any desired article. This worthy effort can only be expanded and continued by each member taking every opportunity to obtain back numbers of these publications and sending them to the National Office.

The Society was most fortunate in having Mr. David X. Clarin accept the chairmanship of the Public Relations Committee. Dave is one of those impatient souls who knows that impatience will show results in a hurry, or else. He has set up an office which will provide an outlet for continuing publicity favorable to the Society by releases to the Branches, technical publications and newspapers.

Membership in the Society continues to grow, although at a lower rate than has been experienced during the past five years. We now have over 5,000 active members.

When Dr. Charles Faust, Chairman of the Platers' Handbook Committee, found the press of other work too great to permit his devoting the necessary time to this project, he asked to be relieved of the assignment. Dr. Graham then requested that the preparation of the handbook be assigned to his office. His plan is to obtain unbiased articles, through the Associate Editors of PLATING, on subjects related to phases of metal finishing not covered by the literature at the present time. These are to be compiled together with standard plating solution composition and analysis formulae into a Handbook for Electroplaters. It is planned to publish the first edition in about a year and follow this with revised editions as more information becomes available. Such a publication will undoubtedly serve to produce more revenue for the Society.

As predicted by Frank Savage, the Detroit Convention was the Society's greatest. However, the plans for the Atlantic City Convention (at the time this report is being written) indicate the Newark Branch will be host to at least an equally successful Convention. The Industrial Finishing Exposition is an assured financial success. On behalf of the members of the Executive Board, I wish to express our appreciation of the cooperation shown by Horace Smith and George Wagner with the Executive Board in planning for the Convention and Exposition. They have kept us informed of their plans and progress through their attendance at the Executive Board meetings and frequent conferences with Dr. Graham, Mr. Putnam and Dave Clarin.

The profit from the Exposition last year amounted to over $17,000 and estimates indicate the profit from the Exposition this year will approach $10,000. These two successful Expositions are only stepping stones to the real value they can be to the industry. Properly managed, they can serve as the best selling medium a supplier has available. In addition to this, they can produce additional revenue for the Society. However, the Society cannot depend on continually obtaining the services of such capable men as those who operated these two Conventions. The time required and the numerous details necessary for continued success require centralization of this effort and the employment of a full time manager for the Exposition. The revised Constitution provides for this step.

During the year, the larger size Society publication, PLATING, became a reality. The new size and format permits easier reading of the technical material, greater latitude in arrangement, the use of standard advertising plates, as well as certain other advantages.

The Society owes Dr. Graham and his staff a debt of gratitude for their unrelenting efforts towards overcoming all the numerous obstacles in the way of changing the magazine and meeting the regular publication date. It is hoped that you, as Delegates, will find time to meet his staff during the Convention. They will be in attendance at the National Office booth at the Exposition. They are working for your interests, and you can believe me that their every effort is directed towards serving you and the members of your Branch.

The increased cost of publication has been met by increased advertising rates. Due to the continued efforts of the Advertising Manager, Mr. Allan R. Putnam, the amount of advertising in the publication has increased, although the general trend of advertising in technical journals is downward.

The magazine continues to produce the greatest percentage of revenue for the Society, although publication costs have increased appreciably during the past year.

The far-reaching plans and able direction of the Research Committee are becoming more apparent to the membership as the reports on the various projects become available. During the formative period of the presently constituted Research Committee, the National Officers were frequently questioned about the value of the research program to the man at the tank. I was not questioned on this subject during any Branch visitations this year. This indicates to me that the research reports published in the monthly magazine serve to answer this question.

The activities of this committee have been under the able direction of its chairman, Dr. Richard M. Wick. Although Dr. Wick has been ill for some time and has not yet fully recovered, the program has continued unabated. The members of the committee and various subcommittees have given generously of their time without recompense, or even expense allowance. It would be a revelation to any of you to sit in on one of this committee's quarterly meetings. The amount of work handled, the dispatch with which details are resolved, and the wholehearted cooperative spirit revealed would leave you with a feeling of awe. After attending such a meeting, I am sure that more effort should be devoted to obtaining additional Sustaining Members for this essential function of the Society.

You, as members, owe a greater obligation to the research activities than you realize. Thirteen Branches raised their dues by $1.00 per year in order to assist the Research Committee in financing its projects. On the whole, this resulted in less than 30 cents from each of the five thousand members. It is hoped that you, as Delegates, are fully cognizant of the value of this effort to the Society and will provide $1.00 per year per member to the Research Fund as a constitutional requirement. Industry supports this effort at the rate of over $4.00 per member per year. A ratio of $4.00 for industry to less than $1.00 for the member requires rectification to at least four to one.

Dr. Wick's paper, "The Research Organization of the American Electroplaters' Society," presented in London before the Third International Conference on Electrodeposition and printed in the December issue of THE MONTHLY REVIEW, offers a very concise summary of the organization of this committee and the projects being investigated.

The Executive Board has long realized the advantages of the National Officers visiting the Branches. It provides the members an opportunity to meet their Officers and present their ideas under conditions where they may be discussed. It offers the Officers the opportunities of keeping the members informed of the Board's actions and aims, and of clarifying any topics which may not be fully understood by the Branch. The war and difficulty in obtaining hotel accommodations prevented any planned Branch visitations by the Officers during our period of greatest growth. During the first two postwar years, we noticed that many of the larger Branches were visited by several Officers and the smaller ones by none. In order to remedy this condition, last August I assigned Branches to be visited by each Officer. This included all Branches except the two in California and the three in Australia. My assignment of ten Branches was completed, with one exception where I received no replies to my correspondence trying to arrange a visit. If your Branch was not visited by a National Officer this year, it may be well to determine whether your Branch officers received a request for a visit.

Dr. Graham's recently announced program for a monthly A. E. S. News Letter to the Branch officers will be of considerable help in providing the Branches with advance information in order to acquaint the members with matters of importance. These letters will pertain to PLATING editorial policy, membership, *Proceedings*, *Handbook*, Research Program, Operation of the National Office, etc.

Officer travel this year, as in past years, was materially assisted by the generosity of the employers of the National Officers. In my own case, I gratefully acknowledge the generous attitude of my employer, The Armco Steel Corporation, for assistance in carrying out my duties as President of the Society.

Although the financial statement for this year indicates that the cost of operation of the Society was well within its income, we still do not have a sound financial structure. A large proportion of our surplus is represented in $5,000 received from the Detroit Exposition and Convention and $2,500 received from the Research Fund. These are not recurring items.

Income from the monthly publication accounts for approximately 75 per cent of our revenue this year, membership dues accounts for 15 per cent. This ratio will be improved during the coming year when the effect of the dues increase passed by referendum vote becomes effective.

However, as time passes, I believe many of you will realize that our Society is now passing through a critical stage. We have expanded our membership to the extent that we are justly proud. We have become recognized as a technical Society instead of a trade organization. But the organization of the business machinery to serve the Society is only nearing realization. The Executive Board and each member of the Society are deeply indebted to Dr. Graham for the manner in which he has devoted his efforts towards placing the Society on a sound business basis. His approach towards increasing the quality of PLATING through Associate Editors, his business approach towards selling that publication as an advertising medium, and his organization of the office force to insure a continuing service to you under the most adverse circumstances are well known to the Executive Board. None of them has been accomplished without many disappointments and most anyone else would have given up the attempt before the goals were realized. Many of you Delegates will not realize the benefits accruing to the Society from these efforts for some time. However, you will have the opportunity during this Convention of determining whether the spade work done by Dr. Graham and his associates is to be recognized and approved so the Society may continue its forward movement, or whether you desire to revert to our status at the end of the war.

Our interests have become so diversified and time-demanding that we can no longer expect many of the functions to be handled on a gratuity basis. They must be centralized in one office and given the attention demanded of one qualified for and paid to do the work.

I earnestly urge you to take the facts as they will be presented and grant your Officers the privilege of building a solid foundation for our future growth.

During the year the Executive Board granted two temporary charters to the Louisville, Ky., and the Saginaw Valley, Frankenmuth, Mich., Branches. It is understood that progress is being made in organizing additional Branches in Hamilton, Ontario, Winston-Salem, N. C., Scranton, Pa., and Canton, Ohio. It is hoped these efforts will result in Branches being established in these cities in the near future.

At the beginning of my term, a Paper Award Committee consisting of Dr. Harold J. Read, Chairman, Mr. R. O. Hull, and Mr. W. A. Wesley was appointed.

Mr. Joseph E. Underwood also accepted appointment as Residing Legal Officer of the Supreme Society in the State of New Jersey.

A Credentials Committee was appointed early in May in order to permit clarification of any discrepancies in delegate certification prior to the Convention.

I wish to take this opportunity gratefully to acknowledge the cooperation that Miss Marquardt, the Convention Reporter; the Branch officers; the Executive Board; and Dr. Graham and his staff have given me during the year. The progress of the Society in that time could not have been attained without their whole-hearted assistance.

It has been a pleasure to serve you during these past three years. The warm friends and pleasant associations formed during that time have more than repaid the hours I have devoted to the honors you have bestowed on me.

KENNETH M. HUSTON.

FIRST VICE-PRESIDENT'S REPORT

Johnston

The traditional specific assignment of duties within the Executive Board gives this officer the responsibility of serving as Educational Chairman. These duties are so varied that it becomes difficult to summarize the actual accomplishments at the end of a busy and eventful year.

In any well-managed organization, the newly elected president presents a program of objectives for the organization to achieve. So it has been during my two years on the Executive Board. Messrs. Savage and Huston have set goals, before undreamed of, for this Society and have, by their own perseverance and example, sparked the Society to an enviable position among technical groups.

The principal medium of current educational activities is the monthly publication. A board of Associate Editors, appointed from the membership, works with the Managing Editor in procuring new and interesting papers, consultation on editorial policy and any specific individual assignments. The board which served during the previous fiscal year was asked to continue on this work and the enthusiasm with which Dr. Blum, Dr. C. L. Faust, Dr. W. R. Meyer, Dr. R. B. Saltonstall, Dr. R. A. Schaefer, Mr. B. C. Case and Mr. M. B. Diggin accepted was very gratifying. In January, 1948, with a change in size of the publication and addition of new departments, Messrs. E. H. Bucy, R. R. Sizelove and L. V. Verzier were invited to become Associate Editors and their response was wholehearted. Dr. Harold J. Read accepted reappointment to prepare reviews of new books and Mr. George B. Hogaboom again handled the patent section.

January, 1948 marked a milestone in the educational activities of the Society with the change, both in name and size, of the monthly publication. The name now denotes the field covered and the larger type facilitates reading. Scattered reaction has been enthusiastic for the new publication. It is, however, the property of the members of the American Electroplaters' Society, and your opinion is paramount. The Executive Board hopes that your wishes have been fulfilled.

Mr. Horace Smith, General Chairman of the Atlantic City Convention, appointed Mr. Myron B. Diggin as Educational Chairman in charge of procuring papers to be given before the Convention. Mr. Diggin, in turn, appointed a capable committee, and their combined efforts have been so fruitful that no assistance has been necessary from this office.

Mr. Huston, during his tenure as Educational Chairman, was instrumental in making the Society aware of the need for courses of instruction in metal finishing. As a consequence, this work is continuing and Dr. Blum heads a committee which is preparing courses of instruction at several levels of learning. Several schools have instituted classes during this year, among them Wayne University in Detroit, Rhode Island State College in Providence, and the Electroplating Institute of America in Pittsburgh. It should be the aim of this Society to foster and make available, at a nominal cost, courses of instruction which will further

the knowledge of metal finishing among its members and other interested people.

A continuing effort is the establishment of a complete file of THE MONTHLY REVIEW in a library of each Branch city. This campaign takes on added significance at this time because THE MONTHLY REVIEW has now gone out of existence. The February, 1948 issue of PLATING lists those eighteen Branches which have undertaken this activity, several of which have only begun in the past year.

Visual aids which illustrate metal finishing and allied processes are in demand for showing before Branches, trade schools, high schools, and groups with a genera- interest in the field. A listing of avail able films and slides of this type is being prepared for early publication in PLATING. It has also been suggested that proceeds from the Industrial Finishing Expositions could be advantageously used for the preparation of a movie which would accurately depict the various phases of plating operations. Active work is in progress to crystallize these ideas into a formal report.

At the time of writing this report, letters are in the hands of more than a hundred companies and individuals inviting them to make or be available as speakers at the various educational functions of the Branches. Many replies have already been received, and all will be listed in the July issue of PLATING. This will make it possible for Branch educational programs to be entirely filled before the fall meetings start.

The First Vice-President has attended all meetings of the Executive Board. He was also accorded the honor of presiding over the Annual Meeting of the Dayton Branch. Other Branch visitations are contemplated in April and May. Thanks are expressed to the Weirton Steel Company for making time and funds available in carrying out the responsibilities of this office.

In conclusion, I wish to express my gratitude for the cooperation of the other Board Members, the Executive Secretary, the Staff of PLATING, and the Personnel of the National Office. They have made the load seem light.

S. S. JOHNSTON.

SECOND VICE-PRESIDENT'S REPORT

Logozzo

The Second Vice-President was assigned the unenviable position of Chairman of the Constitution Revision Committee, composed of Messrs. Cleve Nixon, Clyde Kelley, Frank MacStoker, and Frank Keller. The A. E. S. was broken down geographically with each member of the Committee, including the Chairman, assigned several Branches in his section of the country. The Committee then sought to gather all ideas possible for a new constitution so the A. E. S. membership would have something they wanted to live by in their various functions in the organization. The policy of the Committee was to correlate all the data collected and use what the majority desired in all cases. The final disposition of the Constitution will be decided at the Atlantic City Convention, where each item will be discussed and voted on individually.

Manson Glover, of the Boston Branch, acted as official technical proofreader of the Revision, and without his help the job would have been much more difficult and perhaps not even finished.

The Second Vice-President attended all Executive Board Meetings during the year and participated in all matters decided by mail. Educational talks were given in Bridgeport, Syracuse, New Haven, Springfield, Hartford, New York Annual, and Pittsburgh. Several other Branch meetings were visited, including the Boston Annual Meeting.

Several applications for Branch Charters are being considered, including Louisville, Ky., and Saginaw Valley, Mich. Both of these will undoubtedly mature into active, flourishing Branches.

The A. E. S. Membership continues to grow by leaps and bounds. As of the end of the fiscal year, on April 31, we had 5,259 active members, not including the Sustaining Members. The usual Membership Contest was again held with the Pittsburgh Branch winner in the first group with a net per cent gain of 18.6. The Rochester Branch won the second group prize with a net per cent gain of 37.4. The Adelaide Branch won the third group prize with a net per cent gain of 34.7.

The Second Vice-President wishes to extend sincere thanks to all who cooperated with him during the past year; he is particularly grateful to Frank Keller, Frank MacStoker, Clyde Kelley, Cleve Nixon and Manson Glover of the Constitution Revision Committee.

ARTHUR W. LOGOZZO.

Necrology

The following members have died during the year. Many of them contributed greatly to the advancement of the Society which, with their Branches and friends, mourns their passing:

Boston Branch: Charles S. Taylor
Bridgeport Branch: Philip A. Willett
Buffalo Branch: C. W. Logan
Chicago Branch: C. C. Buckingham, Frank Novotny
Cincinnati Branch: Stewart Chipman
Cleveland Branch: Charles H. Stoddard
Dayton Branch: Aloysius Fisher, Robert B. Skinner
Detroit Branch: H. M. Blum, Henry Frank, Jack McGee
Grand Rapids Branch: Axel Rickson
Hartford Branch: Anthony Dascoli
Jackson-Lansing Branch: D. M. Bennett, Jack Garbry
Lancaster Branch: Theodore D. Gaul
Milwaukee Branch: Robert Steuernagel, Sr., Louis Zingler
Newark Branch: Vincent Pellegrino
New Haven Branch: Thomas J. Brosnan, George Kish, Joseph T. Sheridan
Philadelphia Branch: George H. Gehling, Benjamin Minkin
Pittsburgh Branch: L. C. Conradi
Providence-Attleboro Branch: Charles C. Chace
Rochester Branch: Frank E. Schwind
Springfield Branch: Luke D. Mosher
St. Joseph Valley Branch: Frank H. Negley, Clarence Kelley
St. Louis Branch: Clarence Mantei, F. J. Martin
Toledo Branch: Michael Spanolis

THIRD VICE-PRESIDENT'S REPORT

Neill

The Third Vice-President, as nominal head of the Exhibits Committee, naturally becomes involved to a great extent in the plans for the Industrial Finishing Exposition. This marks the second successive year that such an ambitious undertaking has been attempted, and I feel sure it will be in every way as successful as the Exposition in Detroit.

One thing should be made very clear to the membership, who, in seeing the finished product, might be inclined to overlook the vast amount of work and planning that has gone into a project of this kind.

This is no one man job; on the contrary, it requires the concerted and continuing effort of a good many able persons. Without the talent and acumen of Horace Smith, General Chairman; John De Vries, General Vice-Chairman; George Wagner, Exhibits Chairman; Howard Cobb, Exhibits Co-Chairman; Louis Donroe, Chairman of Branch Exhibits, and a host of others, members of both the Newark Branch and other Branches, nothing like the production seen in Atlantic City would have been possible. Mr. Wagner and Mr. Smith met with your Executive Board in November and Mr. Wagner met with it again in February. At both meetings a good portion of a day was spent going over details of the Convention and Exposition. There have been other meetings between your President and these men on this matter. Every member of the Executive Board, including the Executive Secretary, has shouldered the burden of contacting exhibitors, furnishing them with information, and helping in any way possible to make the Exposition a success.

Branch exhibits will occupy a place in keeping with their importance. Prizes for the best branch and individual exhibits will be awarded.

During the past year, your Third Vice-President has visited the Detroit, Cleveland and Dayton Branches and has spoken at the Regional Meeting held by the Columbus, Cleveland and Dayton Branches in the Westinghouse-Mansfield Plant, Mansfield, Ohio. As this is being written, he is scheduled to speak at the National Officers' Night in Dayton on April 9 and will attend the Indianapolis Regional Meeting on May 22. Plans for a visit to St. Joseph Valley Branch are being completed.

I should like to thank the members of the Branches for the kindness and friendliness they have shown me during my visits and at other times when contacting them.

As the "baby" member of your Executive Board, may I be permitted to say that, without exaggeration, the volume of work done by this group is amazing. I didn't realize and, I think, very few of the rank and file of the membership realize the prodigious amount of work the position of an executive officer entails. Your A. E. S. has become a quite large and important technical society in the past few years, and the burden on the officers has increased accordingly. It has been a pleasure and a privilege to serve as a member of the Executive Board, and I want to thank all of you who helped make this opportunity possible.

WILLIAM J. NEILL.

MEMBERSHIP CHANGES DURING 1947-1948

BRANCH	Membership May 1, 1947*	Elected	Reinstated	Transferred In	Transferred Out	Resigned	Suspended	Dead	Net Gain	Membership April 31, 1948
Adelaide	49	19	..	..	..	2	..	..	17	66
Baltimore-Washington	117	12	1	..	..	5	28	..	−20	97
Boston	156	36	1	1	1	8	21	1	7	163
Bridgeport	147	21	..	1	3	3	8	1	7	154
Buffalo	98	13	..	.	4	2	8	1	−2	96
Chicago	410	86	11	2	8	2	45	2	42	452
Cincinnati	55	26	1	5	2	..	4	1	25	80
Cleveland	190	25	..	3	3	5	19	1	..	190
Columbus	35	9	1	1	1	3	4	..	3	38
Dayton	95	10	..	..	8	2	3	2	−5	90
Detroit	418	78	3	6	20	11	72	3	19	399
Grand Rapids	138	39	1	1	3	11	24	1	2	140
Hartford	140	14	2	..	..	2	1	1	12	152
Indianapolis	103	26	5	1	1	2	29	..	..	103
Jackson-Lansing	65	12	..	2	1	6	6	2	−1	64
Lancaster	38	12	..	..	..	2	1	1	8	46
Los Angeles	195	62	..	8	2	6	23	..	39	234
Louisville†	...	15	..	3	..	..	..	..	18	18
Melbourne	60	28	..	..	..	..	1	..	7‡	67
Milwaukee	124	16	3	2	2	9	12	2	−4	120
Montreal	59	8	..	1	..	3	2	..	4	63
Newark	253	46	3	2	3	6	21	1	20	273
New Haven	114	10	2	..	5	6	2	3	−4	110
New York	257	31	1	..	2	2	15	..	13	270
Philadelphia	191	37	3	1	3	3	19	2	14	205
Pittsburgh	126	30	..	1	2	5	..	1	23	149
Providence-Attleboro	126	27	..	..	2	7	26	1	−9	117
Rochester	87	31	3	2	1	1	..	1	33	120
Rockford	64	4	..	..	3	..	6	..	−5	59
Saginaw Valley†	...	38	..	..	..	..	..	..	38	38
St. Joseph Valley	88	18	..	1	..	3	4	2	10	98
St. Louis	96	7	3	1	..	2	..	2	7	103
San Francisco	76	9	..	1	..	4	5	..	1	77
Southeastern	43	13	..	..	1	2	4	..	6	49
Springfield	49	8	..	..	..	2	1	1	4	53
Sydney	78	21	2	1	..	3	8	..	13	91
Syracuse	73	5	1	1	..	..	3	..	4	66
Toledo	55	28	1	1	1	2	15	1	11	73
Toronto	136	18	..	1	1	5	6	..	7	143
Twin City	90	11	..	..	..	1	23	..	−13	77
Waterbury	126	6	..	2	1	3	2	..	2	128
At Large	78	19	3	33§	..	1	18	..	36	114
Total	4,898	984	51	85	84	142	489	34	351	5,249

*Corrected during the year by subtracting foreign members not affiliated with any foreign Branch and now included under At Large, and in consultation with Branch secretaries.

†Branches with Temporary Charters.

‡Including an unspecified loss of 20 members.

§These are 33 members in process of transfer from one Branch to another.

TABLE I. CONDENSED ANALYSIS OF INCOME AND EXPENDITURES FOR FISCAL YEAR 1947–1948

	$ per member*	% of total
General Fund		
Total Income	18.64	.....
Total Expenditures	15.49	.....
Net Gain	3.15	.....
Analysis of Income (General Fund)		
PLATING, advertising and sales	13.85	74.4
Proceedings, sales	.26	1.3
Per Capita Tax	2.49	13.4
Other	2.04	10.9
Total	18.64	100.0
Analysis of Expenditures (General Fund)		
PLATING, publishing	10.68	69.0
Proceedings, publishing	2.00	12.9
Other Society Operations	2.81	18.1
Total	15.49	100.0
Research Fund		
Total Income	5.05	.....
Total Expenditures	5.15	.....
Net Loss	0.10	.....

*Based on 5,259 members on April 30, 1948.

TABLE II. RECLASSIFICATION OF ACCOUNTS FOR IMPROVED BUDGETARY CONTROL, BASED ON AUDIT OF GENERAL FUND FOR FISCAL YEAR 1947–1948

	Society	PLATING
INCOME		
Advertising, net	.....	$71,180.76
Sales, PLATING	.....	1,676.97
Other Sales, Interest	$3,321.73	.....
Per Capita Tax, Foreign Dues	14,092.29	.....
Miscellaneous*	7,775.48	.....
Total	$25,189.50	$72,857.73
(Budget)	(24,690.00)	(49,200.00)
EXPENDITURES		
Publishing PLATING	.....	$32,937.04
Commissions, Advertising Manager	.....	3,882.01
Publishing *Proceedings*	9,084.19	.....
Convention Expense	1,724.47	.....
Public Relations Committee	251.70	.....
Other Items	1,295.58	.....
Salaries (8 persons)	8,548.00	12,822.00
Travel Expense	1,349.20	2,808.02
Officers' Office Expense	341.00	.....
National Office Expense	2,020.00	3,445.13
Constitution Revision Committee	606.67	.....
Taxes	106.79	160.18
Total	$25,327.60	$56,054.38
(Budget)	(23,367.00)	(48,133.00)
Profit (or Loss)	−138.10	+16,803.35

*Includes $5,000.00 from Detroit Convention and Industrial Finishing Exposition. A balance of $13,977 94 from this source has been reported.

PAST PRESIDENT REPORT

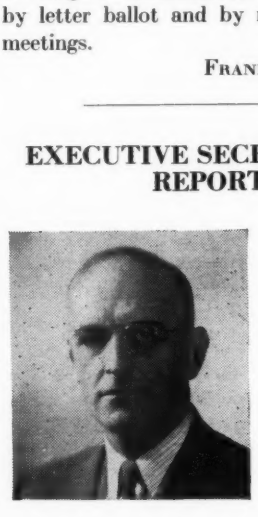
Savage

The Constitution provides that the immediate Past-President be a member of the Executive Board and serve as Chairman of the Law Committee.

I wish to report that these duties have been fulfilled by attendance at each Executive Board meeting during the year. All amendments to and revisions of the Constitution and By-Laws of the Society have been properly presented to and considered by the Law Committee as to wording and classification. This was done by letter ballot and by regularly called meetings.

FRANK K. SAVAGE.

EXECUTIVE SECRETARY'S REPORT



Graham

Many of the accomplishments of the past year have been covered in the reports of the Officers of the Society and need no further comment here. It should be noted, however, that the "new look" of our monthly publication, PLATING, has received universal approval. Members here and abroad, the Australian Branches, our advertisers, as well as friends of the Society, have all commented favorably upon the more descriptive name, the larger size, the improved appearance, the quality of the contents, and the enhanced value of PLATING as an advertising medium. Such confirmation of the judgment of those responsible for these changes should be most gratifying.

The Society cleared $16,665.25 in the fiscal year ending April 30, 1948, not including some $14,000.00 profit from the Detroit Industrial Finishing Exposition remaining to be paid by the Detroit Branch. However, the net gain would only be $9,165.25 if one deducts $7,500.00 non-recurring income. Until the new Constitutions and By-Laws or the provisions they contain are adopted, this So-

ciety will continue to be too dependent for stable operation upon advertising income.

In order that the members may be able better to visualize this situation and the factors involved, a condensed analysis of the income and expenditures (excluding the Research Fund) for the fiscal year ending April 30, 1948 is presented in Table I.

The total income was $18.64 per member, of which $13.85 or 74.4 per cent was from PLATING, $0.26 or 1.3 per cent from the sale of *Proceedings*, $2.49 or 13.4 per cent from Per Capita Tax payments, and $2.04 or 10.9 per cent from all other sources.

The total expenditures were $15.49 per member of which $10.68 or 69.0 per cent was for publishing of PLATING, $2.00 or 12.9 per cent for publishing of the *Proceedings*, and $2.81 or 18.1 per cent for all other Society operations. If the money spent on the Research Program is included, the total expenditures per member amounted to $20.64.

The Society's activities comprise the Society functions and a publishing business. The income as a measure of the volume of business has increased from $15,600.00 in 1940, when the membership was 2,187, to over $98,000.00, not including the Research Program and the Industrial Finishing Exposition, the present membership being 5,259. Our problems in administering these activities have likewise increased, one of the most serious of which is the preparation of an Annual Budget and its application, as provided by the Constitution and By-Laws.

In Table II the accounts of the General Fund for the past fiscal year have been reclassified in order to distinguish between the items pertaining to the publishing business and those relating to the Society functions.

On this basis the Society income was $25,189.50, which includes the sale of books, reprints and supplies, Per Capita Tax, foreign dues and miscellaneous items. The latter embraces $7,500.00, comprising an appropriation from the Detroit Convention profit and an assessment from the Research Fund to cover some administrative expenses. Since the Society expenditures were $25,327.60, the Society operations show a loss of $138.10. If it were not for the above mentioned appropriations, the loss would have been $7,638.00.

The income from PLATING, including revenue from advertising, subscriptions and sales of individual copies, was $72,757.73. The total expenditures were $56,054.38, leaving a profit of $16,703.35.

The Society functions can be rigidly budgeted and administered as provided by the Constitution and By-Laws. The publishing business can only be controlled by a flexible budget realistically administered in a manner consistent with good business management. It is impossible on a certain Thursday in July to anticipate with any accuracy the magnitude of the income and of the many expenditures involved in publishing PLATING twelve months in advance. It is unwise and impractical to limit the various publishing expense items to a 10, 20 or any fixed percentage increase. If more money can be made by spending money, then the Executive Board should have the power to authorize such expenditures. Similarly, if retrenchment is necessary, the Board should be expected to act accordingly.

Inspection of the publications accounts in Table II indicates the desirability of such handling. The advertising manager's travel expense and commission payments and the printing costs exceeded the budget estimates by substantial amounts and the total expenditures were $9,721.38 greater than the budget estimate. However, the income exceeded the budget estimate by $23,557.73.

The Officers of this Society for a number of years have recognized the possibility of making money by publishing books. Other societies have done this, but our efforts to prepare a handbook for the metal finishing industry, as well as a comprehensive index of both the *Proceedings* and our monthly publication, have not progressed very far. The success of the Glasstone book indicates, in a small way to be sure, the possibilities. These and similar activities could be accomplished promptly if the Society would invest funds for this purpose. They may properly be regarded as educational

FINANCIAL STATEMENT OF THF SUPREME SOCIETY OF THE AMERICAN ELECTROPLATERS' SOCIETY, INC.

General Fund

BALANCE SHEET, APRIL 30, 1948

ASSETS		
Demand Deposit—Jenkintown Bank and Trust Company		$25,178.20
Petty Cash		25.00
Time Deposits:		
American National Building and Loan Association, Baltimore, Md.	$ 5,000.00	
Peoples Federal Savings and Loan Association, Detroit, Mich.	5,000.00	
Savings Fund Society of Germantown, Philadelphia, Pa.	5,000.00	
Standard Savings and Loan Association, Detroit, Mich.	5,000.00	
Surety Savings and Loan Association, Detroit, Mich.	5,000.00	25,000.00
Accounts Receivable:		
Advertising, Subscriptions, Books and Reprints	$ 7,429.01	
From Local Branches:		
Per Capita Taxes	608.20	
Supplies	91.45	
Foreign Membership Dues	334.00	8,462.66
Deposit with Bell Telephone Company		200.00
Deposit with Copyright Office		32.00
Total Assets (Note A)		$58,897.86
LIABILITIES AND FUND		
Liabilities:		
Pay Roll Taxes withheld from employees	$ 305.10	
Advance Payments	688.89	
Total Liabilities		$ 993.99
General Fund:		
Balance, May 1, 1947	$41,238.62	
Add: Excess of Income over Expenses for the Fiscal Year ended April 30, 1948, as annexed	16,665.25	
Balance April 30, 1948		57,903.87
Total Liabilities and Fund (Note A)		$58,897.86

Note A: Exclusive of inventories of publications, literature and supplies, office furniture and equipment, accounts payable and prepaid and accrued expenses.

activities and should therefore be encouraged by the Society.

The membership records in the Secretary's office have been vastly improved during the past year but not without untiring effort on the part of the office personnel in charge and the cooperation of the Branch Secretaries. However, since some Secretaries have been remiss and all parties involved can make mistakes, much time is still spent in reconciling Branch and Society records. Many of the difficulties result from incompleted transfers or errors in handling the transfers. In two cases the members were not accepted by the in-transfer Branch and left like men without a country.

The membership report shows a net gain of 361 members during the past year. The fact that there were 967 new members and 602 members lost by resignation or suspension should be emphasized. One might inquire as to what steps can be taken to reduce this large turnover and, more important, endeavor to determine the possible causes.

There have been 259 Branch News items printed during the past year. The improved cooperation of the Branches is illustrated by the following comparison with the previous year.

BRANCH NEWS ITEMS

Number of items	1947	1948
10–18	8	7
5–9	16	24
1–4	15	5
0		3

The 34th Annual Proceedings, in addition to being very carefully edited by the Associate Editors and the Editor of PLATING, was improved by the inclusion of Society data and a better printing job. This placed an additional heavy load on the Editor, but the favorable comments of the members and the result attained appear to justify this method of handling.

Many inquiries for information have been received by the Secretary. A number of them have been referred to qualified members for comment and some have been published, with answers, in the Question Box department in PLATING.

In addition to the Editor and Advertising Manager of PLATING there are five girls in the Secretary's Office at the present time. They have taken great pride in the growth of the Society and its new publications and have contributed much.

I take this opportunity to thank the employees for their faithful, conscientious service beyond the call of duty.

A. KENNETH GRAHAM.

STATEMENT OF INCOME AND EXPENSES FOR THE FISCAL YEAR ENDED APRIL 30, 1948

INCOME			
Advertising		$76,114.06	
Less: Discounts allowed	$1,223.50		
Agency commission	3,709.80	4,933.30	$71,180.76
Sales			
PLATING		$ 1,676.97	
Proceedings		1,350.74	
Glasstone Book		432.13	
Books and Reprints		1,077.06	
Branch Supplies		430.55	4,967.45
Per Capita Taxes Levied			13,090.22
Foreign Membership Dues Levied			1,002.07
Interest on Investments			31.25
Miscellaneous			7,775.48
Total Income			$98,047.23
EXPENSES			
Advertising Commissions			$ 3,882.01
PLATING			32,919.04
Proceedings			9,084.19
Copyright Expense			18.00
Glasstone Book			26.40
Books and Reprints			824.98
Branch Supplies			383.20
Convention			1,724.47
Salaries			21,370.00
Traveling Expenses:			
Executive Secretary		$ 349.46	
Advertising Manager		2,808.02	
Officers		999.74	4,157.22
Furniture and Fixtures			51.00
Officers' Office Expense			341.00
Public Relations Committee Expense			251.70
Secretary's Office Expenses			5,465.13
Constitution Revision Committee Expense			606.67
Taxes			266.97
Uncollectible Accounts			10.00
Total Expenses (Note B)			$81,381.98
SUMMARY			
Total Income			$98,047.23
Total Expenses			81,381.98
Excess of Income over Expenses (Note B)			$16,665.25

NOTE B: The expenses reported do not take into account the changes during the fiscal year in inventories of publications, literature and supplies, office furniture and equipment, accounts payable and prepaid and accrued expenses.

RESEARCH COMMITTEE CHAIRMAN'S REPORT

Wick

Organized anew in 1944, the Research Committee this year completes its initial cycle with the expiration of the first three-year term of members appointed in 1945. The basic concepts and details of the research organization of the American Electroplaters' Society is found in a paper prepared by the writer at the request of the Executive Board of our Society for presentation at the recent International Electrodeposition Conference held in London, England, under the sponsorship of the Electrodepositors' Technical Society, and published in the December, 1947 issue of THE MONTHLY

REVIEW. The table of organization is found in the accompanying chart.

No new projects have been established during the year. Instead of expanding the number of projects, the Research Committee has authorized increased emphasis through additional help on several researches to speed the attainment of valuable results that are in sight. These researches are: Project No. 5 on "The Effect of Impurities and Purification of Electroplating Solutions"; Project No. 6 on "Nature and Effects of Porosity in Electrodeposits"; and Project No. 10 on "Disposal of Plating Room Wastes."

Expenditures of the Research Committee during the year have been kept in close balance with income received from Sustaining Members, Branch contributions, and investments of reserve funds. The maximum number of projects active at any one time during the year has been eight. The turn-over in Assistants and Fellows due to graduation and other causes has interfered with several projects, especially because, under present conditions, it has been particularly difficult to obtain the services of qualified persons for this work. Project No. 7, on "Methods for Testing Thickness of Electrodeposits," has had to be suspended until summer on this account. Project No. 8, on "Polarization at Electrodes in Electroplating Processes," has recently become inactive due to resignation of Dr. A. L. Ferguson as Project Director. Studies toward several new projects are well under way, and it is believed that this thorough preliminary study of the new projects will more than make up for the time thus spent and conserve the limited funds available for experimental work.

A Project Committee has been appointed for Project No. 11 on "Current and Metal Distribution in Electroplating," and this committee has formulated an excellent program. Decision as to the institution at which this research is to be located has been delayed by circumstances beyond our control.

Acknowledgment is made to Dr. Louis Weisberg, Chairman of the Research Directing Committee, and his Vice-Chairmen, Mr. W. M. Tucker, Mr. B. C. Case, and Dr. C. F. Gurnham, for their able work in the direction of the Research Projects. The work of the Project Committees has been outstanding and of such effectiveness that this principle of organization for a technical society's research program can be considered established.

A special committee consisting of Dr. W. Blum (Washington, D. C.), Chairman; Mr. Frank Clifton (Detroit), and Mr. Albert Hirsch (Philadelphia), was appointed to prepare an outline of courses of trade school grade in science for electroplaters. The primary purpose of such a manual is to guide instructors of these classes regarding the desirable scope of the courses. The first draft of the manual has been prepared, and after further revision it will be submitted through the Research Committee to the Executive Board's First Vice-President, who is Chairman of the Educational Committee. The courses will require the equivalent of at least three hours per week for thirty-two weeks in each of two years. The principal subjects to be covered are: (1) Elementary chemistry and electricity,

Research Fund

BALANCE SHEET, APRIL 30, 1948

ASSETS		
Demand Deposit—Abington Bank and Trust Company		$18,594.42
United States Treasury 2% Bond due September 15, 1953 (Quoted Market Value $5,075.00)		5,000.00
Time Deposits:		
Atlantic Federal Savings and Loan Association, Baltimore, Md.	$ 5,168.40	
Baltimore Federal Savings and Loan Association, Baltimore, Md.	5,147.11	
Birmingham Federal Savings and Loan Association, Birmingham, Mich.	5,194.43	
First Federal Savings and Loan Association, Detroit, Mich.	5,117.49	
First Federal Savings and Loan Association, Waterbury, Conn.	5,134.51	
Liberty Federal Savings and Loan Association, Baltimore, Md.	5,147.12	
Loyola Federal Savings and Loan Association, Baltimore, Md.	5,157.82	
The Philadelphia Savings Fund Society, Philadelphia, Pa.	5,151.13	41,218.01
Accounts Receivable, Reprints		6.42
Total Assets		$64,818.85
LIABILITY AND FUND		
Liability:		
Pay Roll Taxes deducted from employees		$ 49.50
Research Fund:		
Balance, May 1, 1947	$65,306.36	
Deduct:		
Excess of Expenses over Income for the fiscal year ended April 30, 1948, as annexed	537.01	
Balance, April 30, 1948		64,769.35
Total Liability and Fund		$64,818.85

STATEMENT OF INCOME AND EXPENSES FOR THE FISCAL YEAR ENDED APRIL 30, 1948

INCOME		
Sustaining Membership Fees and Subscriptions	$25,168.63	
Income from Investments	986.38	
Sale of Reprints	375.19	
Total Income		$26,530.20
EXPENSES		
Salaries of Project Directors and Associates	$14,839.60	
Project Payments to Institutions	5,674.89	
Cost of Reprints	688.29	
Supplies	265.60	
Legal Expense	55.00	
Office Expense	1,121.20	
Miscellaneous	4,421.73	
Uncollectible Accounts	.90	
Total Expenses		27,067.21
Excess of Expenses over Income		$ 537.01

HERMANIE DOROTHEA AND CHARLES H. PROCTOR AWARD FUND FOR THE FISCAL YEAR ENDED APRIL 30, 1948

Balance, May 1, 1947	$250.00
Award made during year	100.00
Balance, April 30, 1948	$150.00

The balance of this fund is represented by a demand deposit in Abington Bank and Trust Company.

May 4, 1948

THE AMERICAN ELECTROPLATERS' SOCIETY, INC.
Jenkintown, Pa.

GENTLEMEN:

We have audited the balance sheets of the General Fund and Research Fund of The Supreme Society of The American Electroplaters' Society, Inc., as of April 30, 1948, the statements of income and expenses of such funds for the year then ended and the statement of the Proctor Award Fund for the fiscal year ended April 30, 1948, and, without making a detailed audit of the transactions, have examined or tested accounting records and other supporting evidence, by methods and to the extent we deemed appropriate. With the exception that we did not confirm the amounts due from local branches of the Society and foreign membership dues, our examination was made in accordance with generally accepted auditing standards and included all procedures which we considered necessary in the circumstances.

The accompanying balance sheet and statement of income and expenses of the General Fund are exclusive of certain accounts as more fully described in Notes "A" and "B" thereto.

In our opinion, except as indicated above, the accompanying balance sheets and related statements of income and expenses and the statement of the Proctor Award Fund present fairly the position of The Supreme Society of The American Electroplaters' Society, Inc., as of April 30, 1948, and the income and expenses for the year then ended.

Very truly yours,
LAWRENCE E. BROWN & COMPANY,
Certified Public Accountants.

Philadelphia, Pa.
May 4, 1948

RESEARCH COMMITTEE, 1947-1948

Dr. Richard M. Wick, *Chairman*
Bethlehem Steel Company

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Mr. E. T. Candee, *Vice-Chairman*, Lea Manufacturing Company
Dr. H. L. Kellner, Lea Manufacturing Company
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Mr. B. C. Case, Hanson-Van Winkle-Munning Company
Dr. William Blum, National Bureau of Standards
Mr. Leonard E. Weeg, C. G. Conn, Ltd.

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Dr. A. K. Graham, *A.E.S. Executive Sec.*, Graham, Crowley & Associates, Inc.

RESEARCH DIRECTING SUB-COMMITTEE

Dr. Louis Weisberg, *Chairman*, Consultant, New York City
Mr. William M. Tucker, *Vice-Chairman*, Eastman Kodak Company
Mr. B. C. Case, *Vice-Chairman*, Hanson-Van Winkle-Munning Company
Dr. C. F. Gurnham, *Vice-Chairman*, Consulting Engr., Hamden, Conn.

RESEARCH PROJECTS

Project No.	Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Accepted
2.	"*Determination of Impurities in Electroplating Solutions*"	Lehigh University	Prof. E. J. Serfass Mr. W. S. Levine (Assistant) Mr. P. J. Prang, Jr. (Assistant)	Dr. D. G. Foulke, Chairman; Hanson-Van Winkle-Munning Co. Dr. W. R. Meyer, The Enthone Co. Dr. Henry B. Linford, Columbia Univ.	1944

(2) Analysis of solution and testing of deposits, (3) Principles of electrodeposition, and (4) Importance of plating baths and their operations.

The Publicity Committee of the Research Committee has been concerned chiefly with laying the permanent foundation for publicity work. The methods for issuing publicity material have been developed and correlated with the Executive Secretary's Office, and the system is now in operation. This Committee, with Mr. E. T. Candee as Chairman, has also the responsibility for the preparation of an A. E. S. Research booth in the Exposition in Atlantic City. The methods of handling publicity that have been developed have been recorded in all its phases and are in the hands of the Research Committee for future reference.

The financial support of the research program is the direct responsibility of the Finance Sub-Committee, of which Dr. H. L. Kellner is Chairman, ably assisted by the Vice-Chairman, Mr. H. J. Struckhoff. The Sustaining Members provide the main financial support of the researches. The initial support given by the original Sustaining Members is being continued by most of them, and additional Sustaining Members have joined us in this work, so that there can be reported a steady increase in the number of cooperating companies. In recognition and appreciation of the indispensable value of this support, a Sustaining Membership Certificate has been approved and issued as a slight token of the fine spirit and continued interest of the Sustaining Membership.

Mr. C. H. Sample of the International Nickel Company continued to act as liaison member of A. S. T. M. Committee B-8 on the Research Committee. This coordination of the activities of A. S. T. M. and the American Electroplaters' Society is valuable not only to the respective organizations but also to the entire industry. The Electrochemical Society authorized representatives to attend the last two quarterly meetings of the Research Committee. This was done by invitation in anticipation of the possibility of coordination now obtaining with the A. S. T. M. The question of such coordination between the major societies has been referred to the Executive Board.

Research results that are of immediate use are generally of most interest. Such results have been obtained and are being developed at increasing rate as the respective research projects mature. As Chairman, I thank the Research Committee and its Project Committee, the Executive Board, and the loyal individual and Sustaining Membership of our Society for their continued support that has permitted the research program thus to develop.

RICHARD M. WICK.

SUSTAINING MEMBERSHIP LIST

As of April 30, 1948

(Figures in parenthesis indicate number of membership held.)

Acme Galvanizing, Inc.
Acme Plating Company, The
Acme Steel Company
Advance Plating Company, The
Alsop Engineering Corporation
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American Brass Company
American Buff Company
American Cyanamid Company
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Buckingham Products Company (2)

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Carey-McFall Company
Casco Products Corporation
Chase Brass & Copper Company
Chemical Corporation, The
Chicago Electro-Platers Institute
Christie Plating Company
Chrome-Rite Company (2)
Chromium Corporation of America
Chromium Process Company, The
Chrysler Corporation (2)
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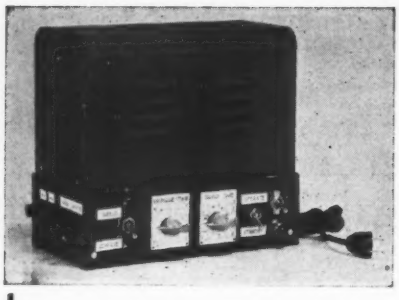
Cleveland Graphite Bronze Company, The
Clinton Company, The
Codman, F. L. & J. C., Company
Corona Corporation
Cowles Detergent Company
Croname, Incorporated
Crown Cork and Seal Company
Crown Rheostat and Supply Company

Darco Corporation
Daystrom Corporation
Detrex Corporation
Divine Brothers Company
Dixie Electro Plating Company
Doehler-Jarvis Corporation (2)
R. R. Donnelly & Sons Company

RESEARCH PROJECT

Project No.	Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Accepted
4.	"*Effect of Surface Finishing of Non-Ferrous Base Metals on Protective Value of Plated Coatings*"	U. S. Time Corp., Middlebury, Conn.	Dr. George J. Kahan Mr. John W. Rigney (Assistant) Mr. J. O. Fairbanks (Assistant) Mr. Joyce Mulcrone (Assistant)	Mr. M. B. Diggin, Chairman; Hanson-Van Winkle-Munning Co. Mr. E. A. Anderson, New Jersey Zinc Co. Mr. A. W. Tracy, The American Brass Co.	1947
5.	"*Effects of Impurities and Purification of Electroplating Solutions*"	Michigan State College	Prof. D. T. Ewing Mr. W. D. Gordon (Assistant)	Mr. B. C. Case, Chairman; Hanson-Van Winkle-Munning Co. Mr. L. B. Sperry, Doehler-Jarvis Corp.	1945
6.	"*The Nature and Effect of Porosity in Electrodeposits*"	Princeton University	Dr. N. Thon Mr. D. K. Kelemen (Assistant)	Dr. W. A. Wesley, Chairman; International Nickel Co. Dr. B. Egeberg, International Silver Co. Mr. A. Mendizza, Bell Telephone Lab., Inc.	1946
7.	"*Methods for Testing Thickness of Electrodeposits*"	Pennsylvania State College	Prof. H. J. Read	Mr. J. Mazia, Chairman; American Chemical Paint Co. Mr. G. Bowman, Standard Steel Spring Co. Mr. A. H. duRose, Harshaw Chemical Co.	1946
8.	"*Polarization at Electrodes in Electroplating Processes*"	Being renegotiated	.....	Dr. R. A. Schaefer, Chairman; Cleveland Graphite Bronze Co. Mr. E. Hahn, Ainsworth Manufacturing Co. Dr. G. Dubpernell, United Chromium, Inc.	1946
9.	"*Physical Properties of Electrodeposited Metals*"	National Bureau of Standards	Dr. A. Brenner Mr. C. W. Jennings (Research Associate)	Dr. W. Blum, Chairman; National Bureau of Standards Mr. C. H. Sample, International Nickel Co. Mr. N. Promisel, Bureau of Aeronautics, Navy Department	1947
10.	"*The Disposal of Plating Room Wastes*"	Yale University	Prof. B. F. Dodge Mr. D. C. Reams (Assistant)	Dr. C. F. Gurnham, Chairman; Consultant, Hamden, Conn. Mr. M. L. Ross, E. I. duPont de Nemours & Co. Mr. M. A. Orr, International Silver Co.	1947
11.	"*Current and Metal Distribution in Electroplating*"	Being negotiated	.....	Dr. R. A. Schaefer, Chairman; Cleveland Graphite Bronze Co. Dr. John Kronsbein Dr. Harold J. Wiesner	1948
12.	"*Cleaning and Preparation of Metals for Plating*"	Being negotiated	.....	.....	.....
13.	"*Internal Stress in Electrodeposits*"	Being negotiated	.....	.....	.....



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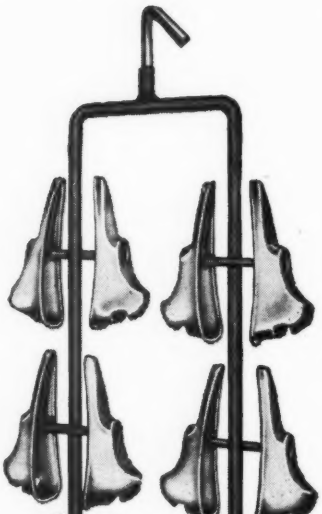

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Enthone, Inc.
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Gorham Manufacturing Company
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Hudson Motor Car Company
Hunter Pressed Steel Company
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Industrial Filter and Pump Manufacturing Company
International Business Machines Corporation
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Now, Parker has developed a complete line of cleaners, tested in production, ready for use in the various conditions encountered in the metal working industry. Parco Cleaners are formulated to save you money in cleaning—and, in some cases, to save you money by actually reducing the amount of phosphating chemical required to coat metal surfaces prior to painting.

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An inhibited phosphoric acid which when reduced with water produces a solution for removing rust and scale from iron and steel surfaces by immersion.

PARCO CLEANER 220
A more active phosphoric acid cleaner to be diluted with water for removing rust and scale from iron and steel surfaces. To be used when slight attack on metal is desired.

PARCO CLEANER 250
A wash-off type phosphoric acid cleaner containing phosphoric acid and an organic grease solvent. To remove grease, oil, rust, and light annealing oxide from iron and steel surfaces.

PARCO CLEANER 260
A dry-off type phosphoric acid cleaner which contains phosphoric acid and an organic grease solvent. A touch-up material to remove grease and spot rusting from iron and steel.

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A homogenized water dispersion of an emulsifiable petroleum solvent cleaner. For pressure spray cleaning prior to Bonderizing.

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A concentrated emulsifiable petroleum solvent cleaner designed for pressure spray cleaning of metal surfaces prior to Bonderizing. Contains no water, will not freeze.

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A nonemulsifiable solvent cleaner designed for use with mineral spirits or kerosene in the immersion cleaning of machined metal parts prior to Parco Lubrizing.

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PARCO CLEANER 301
A water conditioning material formulated especially for stabilizing emulsion type cleaners. Conditions metal surfaces to receive fine, dense Bonderite coating. Reduces amount of cleaner required.

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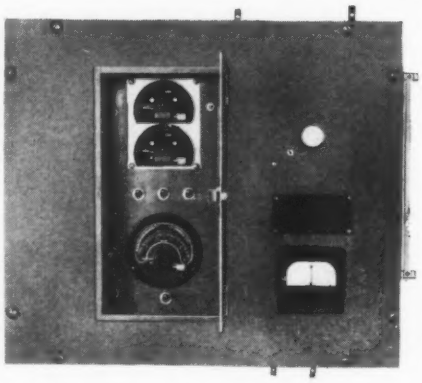

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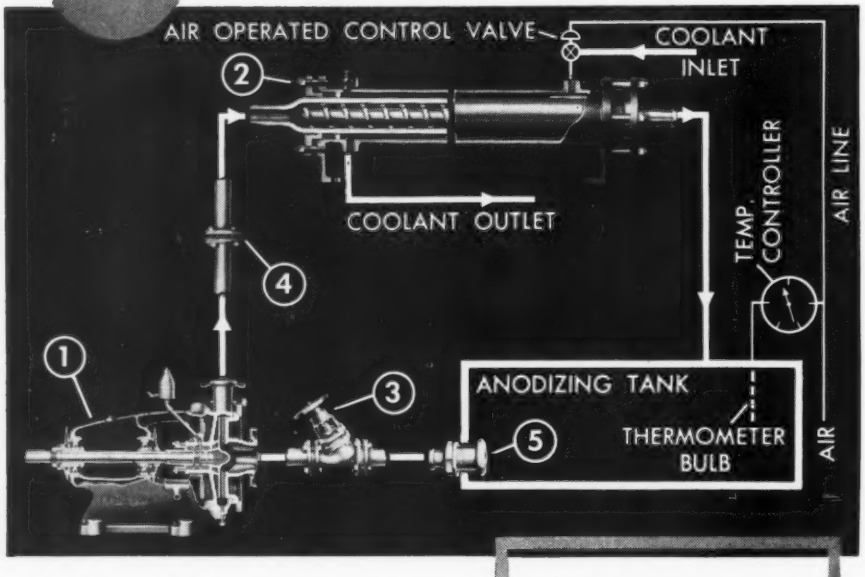

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The Charles Parker Company
Firestone Steel Products Division of Firestone Tire and Rubber Company
Universal Electro-Plating Company

Branch Subscriptions to the Research Fund

Baltimore-Washington Branch	$92.96
Bridgeport Branch	65.50
Cleveland Branch	234.00
Dayton Branch	81.00
Milwaukee Branch	100.00
New Haven Branch	200.00
Philadelphia Branch	342.50
Providence-Attleboro Branch	120.00
St. Joseph Valley Branch	53.00
St. Louis Branch	100.00
Toronto Branch	137.00
Waterbury Branch	117.67
Total	$1,643.63

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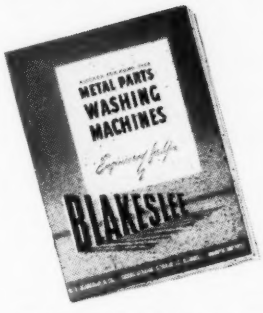

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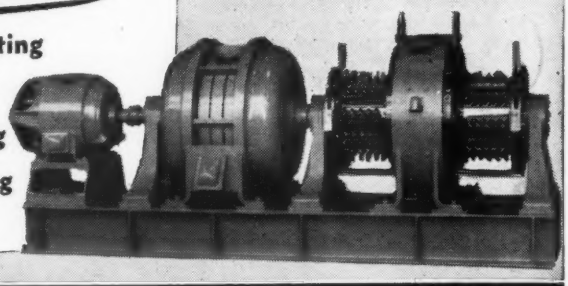
For Electroplating
Anodizing
Electrocleaning
Electropolishing

There's a Columbia M-G Set available for your needs, whether you have a small plating bath or a large continuous strip plating line. Capacities up to 20,000 Amperes; 6 Volts and up. Dependable, performance proved, for many years. Your inquiries solicited.



COLUMBIA ELECTRIC MFG. CO.
4533 HAMILTON AVE. CLEVELAND 14, OHIO

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Filter All Plating Solutions Faster, More Completely in

SPARKLER *Horizontal Plate* FILTERS

Because the filter cake is held horizontally, it is absolutely stable to the end of each filtering cycle. And cycles are longer because the cake retains its porosity longer. That is why the "horizontal principle," as embodied in Sparkler filters, gives you more efficient, low cost, operation. Sparkler filters are pressure-tight and leak-proof, designed for intermittent or continuous operation.

4 Plating Solution Types

1. Rubber-lined for bright nickel
2. Stainless steel for acids
3. All Iron for alkaline solutions
4. All Steel (with Stainless Pump) for chromium

SPARKLER MANUFACTURING CO.
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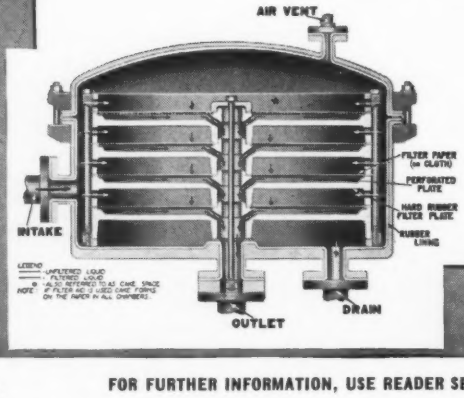

Made in Capacities
60 to 10,000 G.P.H.

See your supplier or Write for details

Our Engineering Service is available for any specialized problems.

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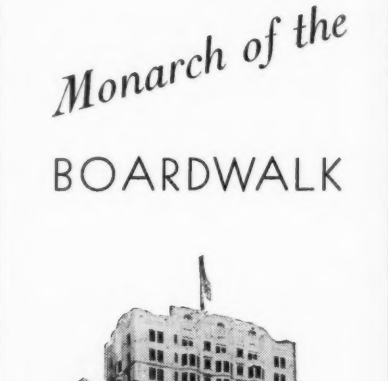
THE AMBASSADOR

Monarch of the

BOARDWALK



Convention Headquarters

AMERICAN ELECTROPLATERS' SOCIETY

June 28 to July 1

A. E. S. News

THE CONSTITUTION AND BY-LAWS

The Proposed Constitution appeared for the second time in the May issue of PLATING in conformance with constitutional requirements.

The Proposed Constitution and By-Laws are the culmination of the efforts of hundreds of members of the A. E. S. who proposed changes and additions to their local Revision Committees, which in turn transmitted these ideas to the National Committee. The National Committee has sifted these numerous thoughts and ideas merely by applying the old democratic principle—majority rule.

Several suggestions came from the National Office, including advancing the beginning of the fiscal year to enable a more accurate financial presentation at the Convention. These suggestions were all in the interest of streamlining the National Office and make it more efficient in face of the increasing load it carries.

The Constitution Revision is going to be presented to the Delegates at Atlantic City, part by part, article by article, and section by section. This will enable the assembled Delegates to change, by two-third majority, anything they wish. Please bear in mind, when instructing your Delegates, that it is a most difficult task to completely satisfy such a large group as we have in the A. E. S. If the Proposed Constitution is basically sound, then let us put it into effect and make amendments as the occasion arises.

If you have any questions about the Revision, please contact any of the Committee members or myself; we shall be happy to explain the reasons for the changes so that you will appreciate better the need for them.

ARTHUR W. LOGOZZO, Chairman
Constitution Revision Committee.

BRANCH LIBRARIES

In the preamble of the A. E. S. Constitution it is stated that "the objects of this Society shall be the improvement and dissemination of the art and science of electrodeposition and all of its allied arts". Since its inception, the Society has published a journal and made a public record of much of the knowledge of the science of electroplating.

Several years ago, a plan was inaugurated for the Branches to sponsor the placing of a complete file of society publications in a local library and to keep it up to date with current numbers as they are published. Those branches which accepted this plan have

1. Established themselves in their communities as a progressive, truly educational organization, living up to the object of their being;
2. Done a community service by broadening the scope of the library service;
3. Made a contribution to industry by making available to students, apprentices, researchers, etc., the techcal contributions of the society;
4. Awakened other organizations to the fact that the American Electroplaters' Society is a top-flight technical and educational group.

The following branches have either established a file in a local library or are actively working toward this goal:

Baltimore-Washington	Newark
Buffalo	New York
Chicago	Philadelphia
Cleveland	Pittsburgh
Columbus	Providence-Attleboro
Detroit	St. Joseph Valley
Grand Rapids	Sydney
Los Angeles	Twin City
Milwaukee	Waterbury

Is your Branch in this group? If not, don't you think it is a good activity for your Branch? Bring it up at the next meeting! The Executive Secretary and the Educational Chairman will give you all the assistance possible.

S. S. JOHNSTON,
Educational Chairman.

(*Continued on page 650*)

FLAT • TOP is a *different* zinc anode. Its difference in shape alone is going to end some of the worst problems in your shop. But **FLAT • TOP** has 6 IMPORTANT ADVANTAGES —

FLAT • TOP'S distinctive appearance makes recognition sure. Stops mixing zinc with cadmium or tin balls. Eliminates dumping, saves time and material.

FLAT • TOP'S area is 20% to 25% greater than a ball. More weight per anode reduces loadings, cuts labor.

FLAT • TOP'S original shape retained—even when dissolved to 25%. A glance avoids incorrect reloading of the anode basket.

FLAT • TOP is 99.99% pure zinc, highest purity anode zinc available. Not readily obtainable from general smelting sources.

FLAT • TOP is smooth. No gates or flash to hang on basket wires.

FLAT • TOP'S tight keg prevents contamination from second hand containers. 250 lb. keg is easily stacked, rolled and trucked.

Yes, **FLAT • TOP** *saves—in every way—yet is the SAME PRICE as troublesome ball anodes in fragile bags or battered drums. Sold by qualified metal finishing supply houses only.*

METAL FINISHING EQUIPMENT
Wagner BROTHERS INC.
POLISHING AND PLATING MATERIALS
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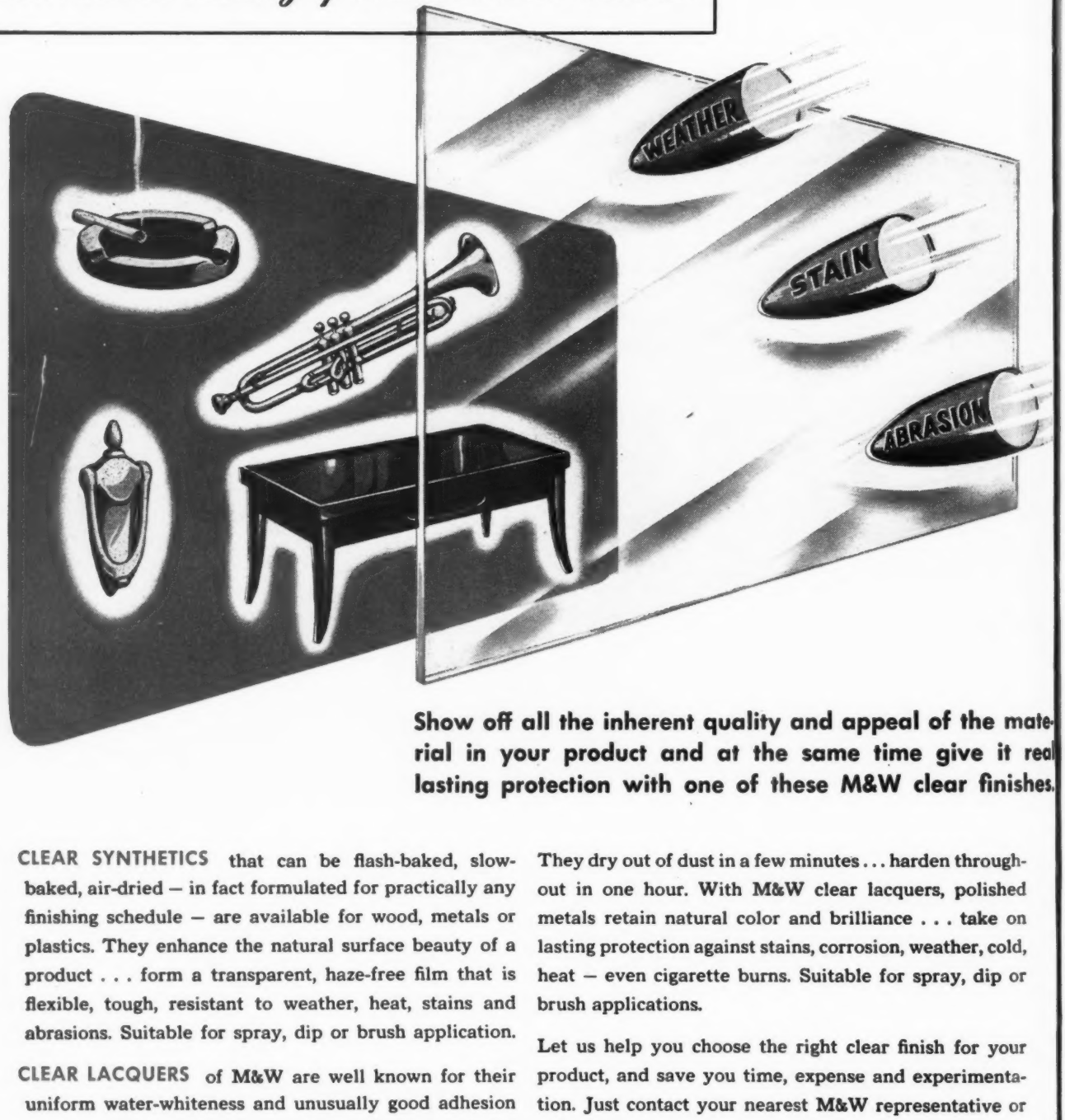
Detroit 3, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 409.

LIKE BULLET-PROOF PLATE GLASS

M & W's Clear Finishes Reveal and Protect the Natural Beauty of Metals-Wood-Plastics



Show off all the inherent quality and appeal of the material in your product and at the same time give it real lasting protection with one of these M&W clear finishes.

CLEAR SYNTHETICS that can be flash-baked, slow-baked, air-dried — in fact formulated for practically any finishing schedule — are available for wood, metals or plastics. They enhance the natural surface beauty of a product . . . form a transparent, haze-free film that is flexible, tough, resistant to weather, heat, stains and abrasions. Suitable for spray, dip or brush application.

CLEAR LACQUERS of M&W are well known for their uniform water-whiteness and unusually good adhesion even to metals ordinarily considered difficult to finish. They dry out of dust in a few minutes . . . harden throughout in one hour. With M&W clear lacquers, polished metals retain natural color and brilliance . . . take on lasting protection against stains, corrosion, weather, cold, heat — even cigarette burns. Suitable for spray, dip or brush applications.

Let us help you choose the right clear finish for your product, and save you time, expense and experimentation. Just contact your nearest M&W representative or write directly to any of the offices listed below.

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M.&W.Co. 1876

. . . where industry goes with finishing problems

MAAS & WALDSTEIN COMPANY NEWARK 4, NEW JERSEY

Boston 15, Mass. • Chicago 12, Ill. • Los Angeles 34, Calif.
Pacific Coast Division: SMITH-DAVIS CO., 10751 Venice Boulevard, Los Angeles 34
PRODUCERS OF LACQUERS, ENAMELS, SYNTHETICS AND SPECIALIZED PRODUCTION FINISHES

Equipment & Supplies

E—81. **Air Pressure Regulator**—The "Air-Warden" is an improved automatic Pressure Regulating Valve manufactured by Hannifin Corporation, 1131 S. Kilbourn Avenue, Chicago 24, Ill., for use on initial air pressures up to 150 psi. It can be set to maintain reduced pressures from 125 down to 5 psi. Compact, it is said to embody construction and operating features heretofore unavailable in a small, moderately priced valve.

Through the use of a "free-floating" valve stem, it is possible to back-off, or reduce, the delivered pressure under dead-end conditions by turning the adjusting screw. Pressure reduction provides high precision control. This same feature also insures positive protection against pressure build-up under dead-end conditions by turning the adjusting screw. Pressure reduction provides high precision control. This same feature also insures positive protection against pressure build-up under dead-end conditions and contributes a stabilizing effect particularly desirable in handling sudden pressure changes.

Prominent features embrace all parts of non-corrosive materials, built-in fine mesh bronze strainer, and all parts accessible without disturbing piping connections. It is produced in two models: RD-1 for ⅜ inch line piping and RD-2 for ½ inch connections. For further information, use Reader Service Card.

E—82. **Small Parts Deburring and Finishing Machine**—A one-compartment "Roto-Finish" machine for small mechanized deburring and finishing, Model CW-22-1 is offered by Sturgis Products Company, 557 Jacob Street, Sturgis, Mich. The 19 inch x 32 inch cylinder is lined with replaceable kiln dried hardwood maple and equipped with a full size, rubber gasketed door, firmly held in place by cam locks. The safety guard raises and lowers easily with minimum effort. For further information, use Reader Service Card.

E—83. **Bilt-On Pumps**—The Pump Division of the Byron Jackson Company, Terminal Annex Box 2017, Los Angeles, Calif., recently announced a new merchandising plan for its line of Bilt-on Pumps, compact pump-motor units for all types of service, designed with interchangeability of basic parts. With 8 cases, 8 motors, 9 impellers and a stock of small parts it is now possible to assemble a Bilt-on Pump that will handle

for a bright, smooth finish

start with WYANDOTTE

IN THE complete Wyandotte line, there's a product especially adapted to each and every barrel-finishing operation.

Wyandotte Burnishing Compound 317 gives ball-burnished parts of zinc a brilliant finish. Its action is not affected by water hardness. Its cutting qualities help speed the tumbling of steel, brass, copper and zinc with stones. It is free-rinsing and leaves no soap "scum" on the work or in the barrel.

Wyandotte Burnishing Compound 320 gives a highly satisfactory finish to parts of brass, copper, bronze or steel.

Wyandotte Burnishing Compound 321 contains a non-toxic brightening agent which provides ball-burnished parts of steel, copper, brass and nickel with a high luster. It does not require the addition of sodium cyanide.

Wyandotte Burnishing Powder is economical for ball-burnishing or tumbling steel with stones. *Wyandotte 80* (for tumbling steel) and *Light Alloy No. 1* (for zinc and aluminum) have thorough detergent action on light soil, in hard or soft water.

For consistently fine results, at low cost, specify *Wyandotte* Burnishing and Burring Compounds. Your Wyandotte Representative will be glad to give you complete details. He's only a telephone call away.

Wyandotte
REG. U. S. PAT. OFF.

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SERVICE REPRESENTATIVES IN 88 CITIES

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Exclusive Distributors

HONITE SUPER HONITE COMPOUNDS	ALMCO TUMBLING EQUIPMENT
manufactured by Minn. Mining & Mfg. Co.	manufactured by Almco Div. Queen Stove Works

Jobber Processing

Engineering Service

METALCRAFT ENGINEERING

230 Verona Avenue, Newark 4, N. J.

Booth 69

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FOR BETTER

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and NICKEL DETERMINATIONS

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NON-FADING GLASS COLOR STANDARDS

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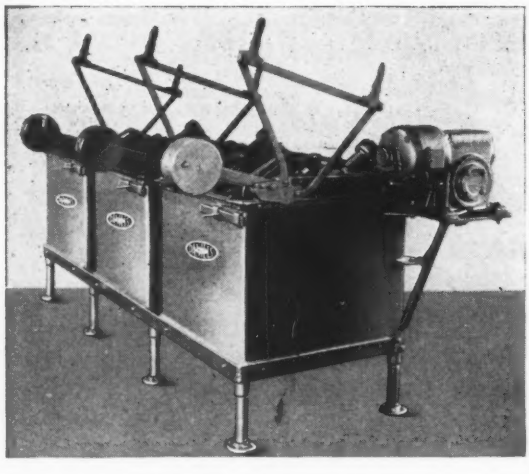
3718 NORTHERN BLVD., LONG ISLAND CITY 1, N.Y.

USE READER SERVICE CARD; INDICATE A 412.

It's the Principle THAT MAKES IT GREAT



DANIELS PLATING BARRELS

The principle of this triple No. 3 OLS incorporates these outstanding features:

- Simplicity of design
- Low installation cost
- Greater efficiency through current distribution
- Direct motor drive
- Sturdy construction
- Adaptable for production plating or varieties of small parts
- Ease in loading and unloading
- Reduced maintenance costs

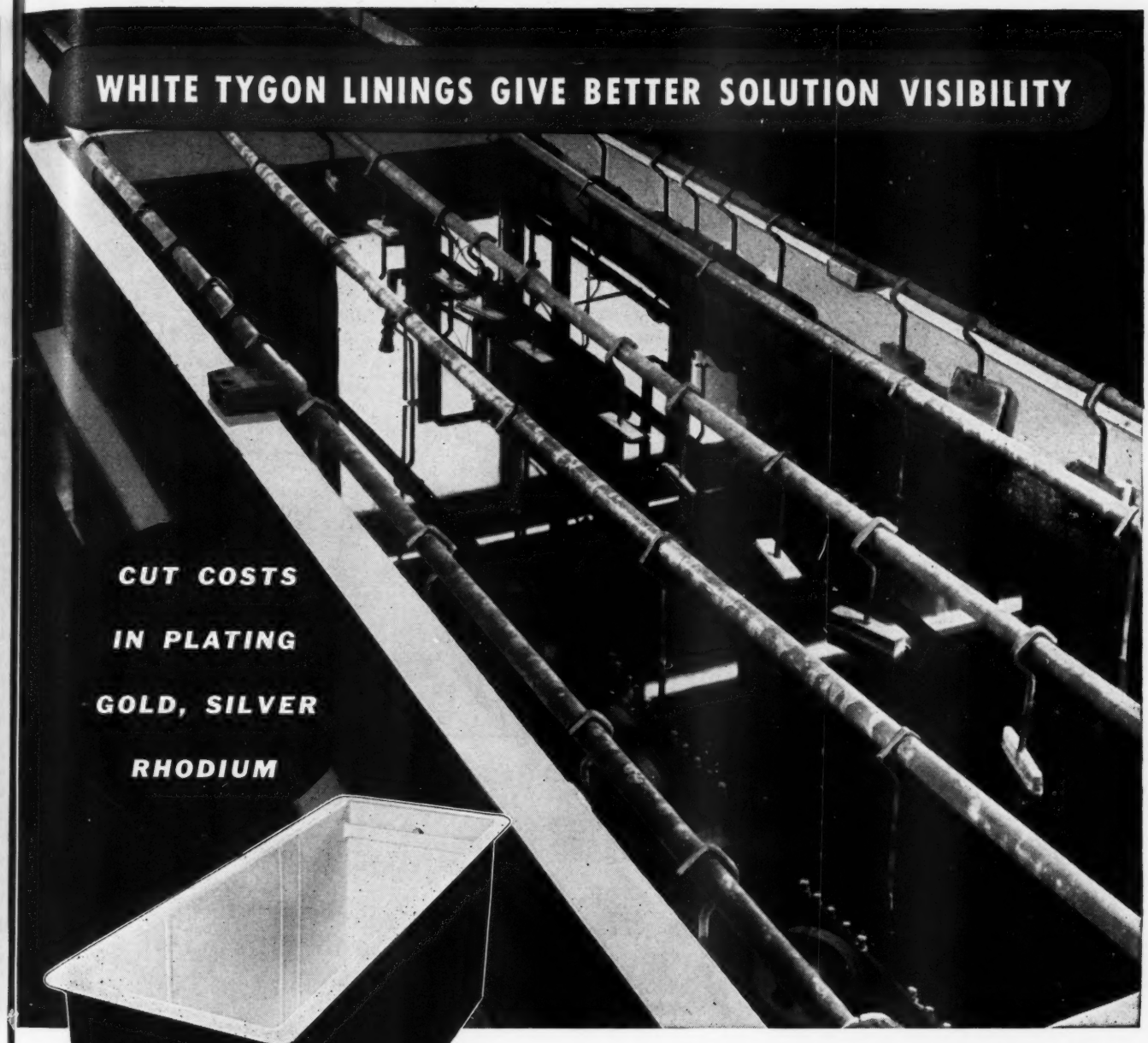
Write or phone for further information

DANIELS PLATING BARREL & SUPPLY CO.

DANIELS MANUFACTURERS & DISTRIBUTORS
Electroplating and Polishing Equipment and Supplies

129 Oliver Street, Newark 5, N. J.

Telephone MArket 3-1762 or MArket 3-6196



STOP CONTAMINATION

A BLACK lining in a plating tank makes all solutions appear black. A work piece may drop to the bottom of the tank to lie there undetected until costly solution contamination occurs.

When your tanks are protected with *white* Tygon linings you have clear seeing to the bottom of the tank. Not only do you eliminate the chance of corrosive attack on a hidden work piece causing contamination, but you can tell at a glance when to filter.

Leading gold, silver and rhodium platers are agreed — "White Tygon tank linings do cut plating costs."

Tygon tank linings are resistant to practically all plating solutions, have excellent electrical insulating properties, high abrasion resistance and amazing long life.

PLASTICS & SYNTHETICS DIVISION

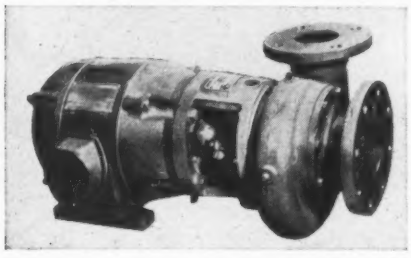
U. S. STONEWARE

Akron 9, Ohio

Equipment and Supplies

capacities from 10 gpm to 600 gpm at heads up to 340 feet, 322 pump combinations in all.

A complete sales and engineering manual with graphical solutions for assembly of the basic parts is supplied to jobbers and dealers. Some districts are still open for Bilt-on franchises. For further information about the Pumps, use Reader Service Card.



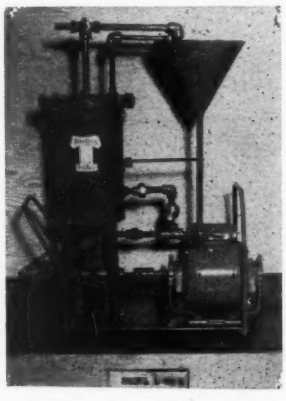
E—84. Cold Paint Stripper—The formulation of a new and improved cold paint stripper is announced by the Allied Finishing Specialties Company, 2639 W. Grand Avenue, Chicago, Ill. The product will be marketed under the "Electro" label and is to be sold in bulk only to the industrial trade.

It is said to be non-inflammable and non-injurious and to remove paints, lacquers, enamels, synthetics, varnishes, and wrinkles almost instantly, requiring no additional operation than a pressure water flushing or wiping well with a rag. It is claimed not to affect aluminum, copper, brass, magnesium, zinc, steel, cast iron or their alloys, even when precision ground or machined, in the time required for removal of the paint film. The Electro Cold Stripper is primarily intended for dipping but may be applied by either brush or spray. It is said to work well on either vertical or horizontal surfaces and to have been found especially effective on hard-to-remove baked-type finishes.

Free testing samples are offered by the manufacturer on direct request from industrial users.

E—85. Anode Bags—The Industrial Filter and Pump Manufacturing Company, 1621–1639 W. Carroll Avenue, Chicago, Ill., has announced a complete line of anode bags for use in a variety of electroplating solutions. Bag sizes range from 5 inches x 20 inches to 5 inches x 108 inches, and from 7 inches x 24 inches to 7 inches x 108 inches. The bags may be obtained manufactured in cotton duck, cotton twill, medium or heavy Synthex, and Rexlon. For further information, use Reader Service Card.

E—86. Portable Filter—A small, compact, portable filter has been developed by Titeflex, Inc., 500 Frelinghuysen Avenue, Newark 5, N. J., for the filtration of small plating solutions with a minimum initial expenditure and no replacement cost. Model L50E is 17 inches long by 18 inches wide by 26 inches high and weighs approximately 70 pounds. It can be used on any plating solution and has a small positive displacement pump rated at 275 gallons per hour and powered by a ¼ hp motor.



This unit can easily be carried from tank to tank or can work continuously on a specific tank, is self-cleaning (does not have to be taken apart for cleaning), and requires no parts, such as bags, sheets, or pads. Model L50E has all the advantages of simplified operation, thorough and quick cleaning, and all the economical features possessed by large Titeflex Filter. For further information, use Reader Service Card.

E—87. Automatic Finishing System—A new automatic finishing system assembly, especially designed for the rapid production of small parts is offered by George Koch Sons, Inc., Evansville 4, Ind. This versatile equipment, which washes, rinses, dries, dips, sprays and bakes in one continuous cycle, is being furnished in standard sizes, having from two to 20 interchangeable operations. Materials employed may be paints, var-

Improved Plating—

WITH SARCO

Controlled temperatures mean uniform, high quality plating, day in and out. Yon can control wash tank temperatures with the Sarco "87" at a cost of a few dollars. Most plating tanks can be controlled with the Sarco "LSI" electric control which costs much less than most methods. For special and highly accurate controls for vapor-line and heating and cooling there are a dozen different Sarco combinations. Four types of Sarco Steam Traps help reduce fuel costs.

SARCO CATALOGS

No. 1025
LSI Electric Control

No. 700
TR-40 Cooling Control

No. 650
Vapor-Line Control

No. 600
Tank Temperature Controls

No. 550
87 Trap-Control

Nos. 350 & 450
Bucket, Thermostatic and Float-Thermostatic Steam Traps

No. 1200
Pipe Line Strainers

ASK FOR THE SARCO CATALOGS ON PLATING

219

SARCO SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
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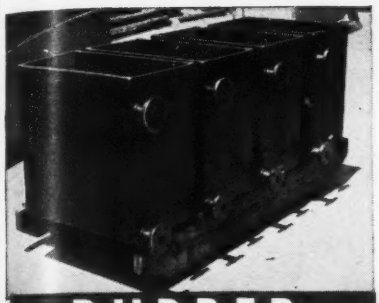
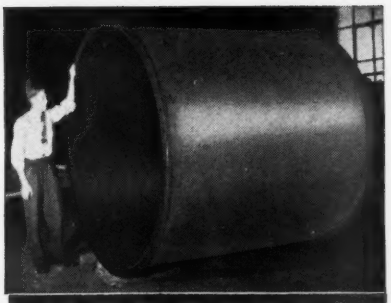
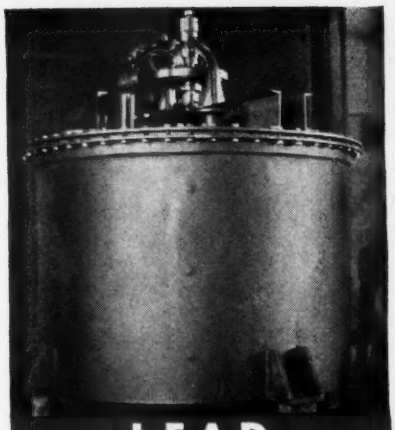
SARCO CANADA LTD. TORONTO 5, ONTARIO



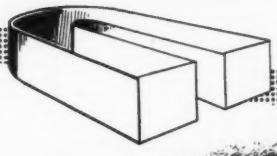
RUBBER

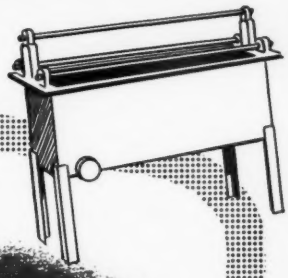


KOROSEAL



LEAD





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RECOMMENDATIONS UNBIASED

SELECTED FOR NON-CONTAMINATION
ELECTRICAL and ABRASION
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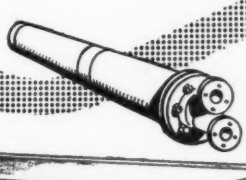
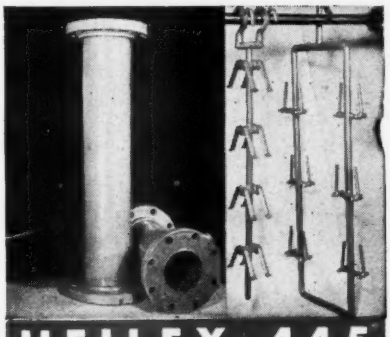
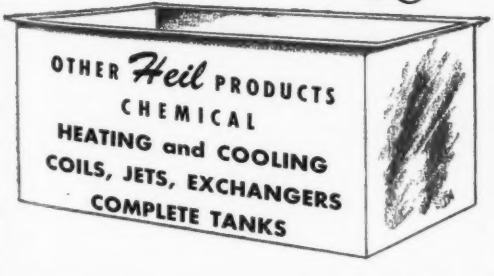




HEILEX 445

445 A vinyl plastic lining or coating-resistant to abrasion and rough handling; excellent stability in alkali and acid solutions: even OXIDIZING ACIDS such as chromic and dilute nitric acid, applied upon conventional as well as IRREGULAR shaped objects

CERAMIC and CARBON



STAINLESS • MONEL
NICKEL • ALUMINUM

HEILEX 486

486 A phenolic base lining or coating. Heat cured to a glossy black hard surface. Acid-resisting including dilute oxidizing acids. Non-toxic, easy to keep clean serving the Food Industry and Water System.

★ WRITE for quotations to build, line or reline your chemical equipment.

Heil PROCESS EQUIPMENT CORPORATION

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nishes, oils, enamels, sealers, shellacs, or synthetics, of air drying or baking type, and requiring temperatures not to exceed 500° F. The usual cleaning solvents and surface preparations are employed. Briefly described: the conveyor is a steel belt to which a series of spring-type clips are removably fastened. Each clip, being equidistantly spaced, is designed to support more articles of work through each successive process step. Belts may be shortened or lengthened, and are joined by riveting. Travel is constant, being spirally passed around a series of horizontally mounted rotating drums and moving across each from left to right, or right to left. Timing is regulated by the selective belt speed, together with a determined number of spiral turns around each drum—necessary to produce the correct number of minutes through any one of several operations. Loading or unloading may be manual or fully automatic. Finished articles are returned to stations at either end, entirely without handling. Tearless dipping is accomplished by flow-out, and initial set developed by gyration of the work after passing once through a small volume, level-controlled paint dip tank. Spraying may be electrostatic, or automatic, using multiples of electrically operated spray guns exhausting into a water-wash cabinet. This equipment bears the trade name "Gyra-Flow," and is available on a 60- to 90-day basis. For further information, use Reader Service Card.

E—88. Fibrous Filter Material—A fibrous filter material, known as Filterbestos, has been devised by the Industrial Filter & Pump Manufacturing Company, Chicago, Ill. It is reported that this material has the advantage of providing a uniform and stable filter layer, which when exhausted peels off the filter cloth or screen cleanly. Use of this material has been particularly recommended for initial precoating operation in connection with either tank or plate-and-frame-type fllters. For further information, use Reader Service Card.

E—89. New Emulsion Cleaner—AhCOLoid Emulsion Cleaner is a new development by Apothecaries Hall Company, Waterbury 88, Conn., to replace hydrocarbon and chlorinated solvents. It is said to be safely used on all metals and to be especially desirable for cleaning buffed zinc base die castings or aluminum parts which would be stained by prolonged immersion in alkali cleaners. Surface active agents are claimed to impart to it a high degree of emulsification, wetting and penetrating action, as well as rapid rinsability. It is classed as a safety solvent with a flash point of 100° F. Operation is at room temperature. Ordinary steel tanks are used to hold the cleaner. When it is used as received, oily films are removed rapidly while caked buffing compositions residues require up to 10 to 15 minutes for effective cleaning. After rinsing, if work is to be plated, a light alkali cleaning is necessary. For many finishing operations, such as blackening, phosphating, painting or lacquering, work is sufficiently clean. For further information, use Reader Service Card.

E—90. Rubber Coated Work Gloves—After nearly six years of being off the market, Grab-It all-purpose work gloves are again available, according to the maker, Edmont Manufacturing Company, Coshocton, Ohio. These fabric-lined gloves with a natural rubber, rough

finish are said to have new improvements such as greater comfort and higher wear-resistance. They are available in two styles as illustrated—No. 660, rubber coated all over, and No. 60, with fabric ventilated back. For oily or greasy jobs, this style may also be had in smooth finish Neoprene coating all over (style No. 909), or with ventilated back and Neoprene coated palm (style No. 93). For further information, use Reader Service Card.

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Is there a *Better* metal finish than the one you now use?

EGYPTIAN FINISHES

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Years of experimentation and development by Egyptian's practical chemists have produced six clear coating materials which may offer you important advantages...and this new booklet tells the whole story.

If you fabricate metal products which require finish, get the facts about these Egyptian coatings. They can help you, as they are helping others right now, to improve product appearance and durability.

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THE EGYPTIAN LACQUER MANUFACTURING COMPANY

SPECIALIZED PRODUCTION FINISHES

P. O. BOX 444, NEWARK, N. J.

RANSOHOFF
SAWDUST DRYING MACHINE

- Compact . . . Simple . . .
- Saves Labor and Sawdust

A tremendous step ahead of old-time methods. Machine is only 7 feet long with 24-inch rotating drum. Continuous worm inside drum carries work which is polished and dried as it is tumbled in the sawdust. Sawdust is separated *automatically* from the work. Simple . . . effective . . . and economical!

Write the RANSOHOFF ENGINEERS to help solve your problems

N. RANSOHOFF, Inc.

9 East 72nd Street — Cincinnati 16, Ohio

FIRST in metal cleaning equipment

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 424.

"CALLING ALL PLATERS"

Be sure to visit the "MUNNING" Exhibit!

Booths 63 and 64
Industrial Finishing Exposition
of
The Electroplaters Society
Convention Auditorium — Atlantic City, N. J.
June 28, 29, 30 and July 1

THE MUNNING LINE

MUNNING & MUNNING, INC.

Manufacturers of Dependable Equipment & Supplies for Progressive Metal Finishers

202-208 Emmett Street — Newark, N. J.

Woolworth Building, New York City • Bourse Building, Philadelphia
190 Wyndham Avenue, Providence, R. I.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 425.

Equipment and Supplies

E—91. Compound Heating Tank—D. C. Cooper Company, 1467 S. Michigan Avenue, Chicago 5, Ill., offers a series of standard size, 3½, 12, 30 and 60 gallon, compound heating tanks designed for uniform heating of insulating compounds, wax, plastic, synthetic glue, resin, and similar compounds. The heater is sturdily built of steel, electrically welded throughout. The jacket around the inner compound chamber contains a special non-carbonizing heat transfer oil, which economically transmits heat throughout the compound chamber, affording even temperature without scorching and eliminating cold or hot spots. It is further insulated with rock wool to retain heat and to keep outside of tank cool at all times. Clogging or freezing of the drain when the compound cools is avoided by a large outlet in the center of the compound chamber. Tank can be equipped with agitator where required. For further information, use Reader Service Card.

E—92. Stainless Steel Pumps—Jabsco Pump Company, 2031 N. Lincoln Street, Burbank, Calif., offers a new stainless steel pump with one moving part only, a tough flexible impeller of neoprene compound selected for its chemical inertness, toughness and wear resistance. The resilience of the impeller is said to provide automatic compensation for wear in the pump body and to facilitate passage of solids without jamming. Operating speeds are from 100 to 1750 rpm; at the latter speed the pump delivers 55 and 38 rpm at 0 and 25 psi head respectively. For further information, use Reader Service Card.

Reduce your overhead ... effectively control fumes

Niehaus Fume Separator

● Niehaus Fume Separators will reduce your overhead two ways . . . overhead expenses and space-consuming overhead ductwork. By water absorption and centrifugal separation, it will effectively control the fumes from your cleaning and plating solutions.

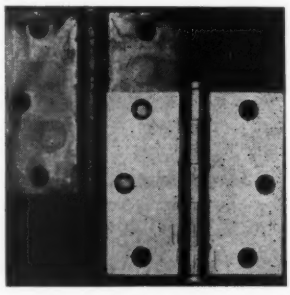
The complete unit is located alongside your tank . . . no expensive blowers or long ducts are required. No air is discharged outside.

For complete specifications and information on how the Niehaus Fume Separator eliminates costly equipment, reduces installation costs, and sells for less. Write for illustrated folder.

See a Niehaus Fume Separator in operation in Booth 11 at the A.E.S. Exposition in Atlantic City, June 28 to July 3. The new Niehaus Dust Control Unit also will be shown for the first time.

INDUSTRIAL ELECTROPLATING COMPANY, INC.
219 West Vermont Street, Indianapolis 4, Indiana

E—93. New Acid Agent for Bright Nickel Plating—Enthone, Inc., Dept. P, New Haven, Conn., has announced the development of a new additive called "Actane" for use in acid dips prior to plating. Its function is to disperse and remove colloidal films from the surface of



Above: Bright nickel plated butts. Sample on left was acid dipped prior to plating in regular acid dip. Sample on right was processed the same except Enthone "Actane" was added to the acid dip

metals that may be deposited during cleaning and which cause the plate to become spotted, streaked, or stained. According to the supplier, the results are particularly beneficial with additions to acids for dipping of non-ferrous metals such as copper and brass prior to bright nickel plating.

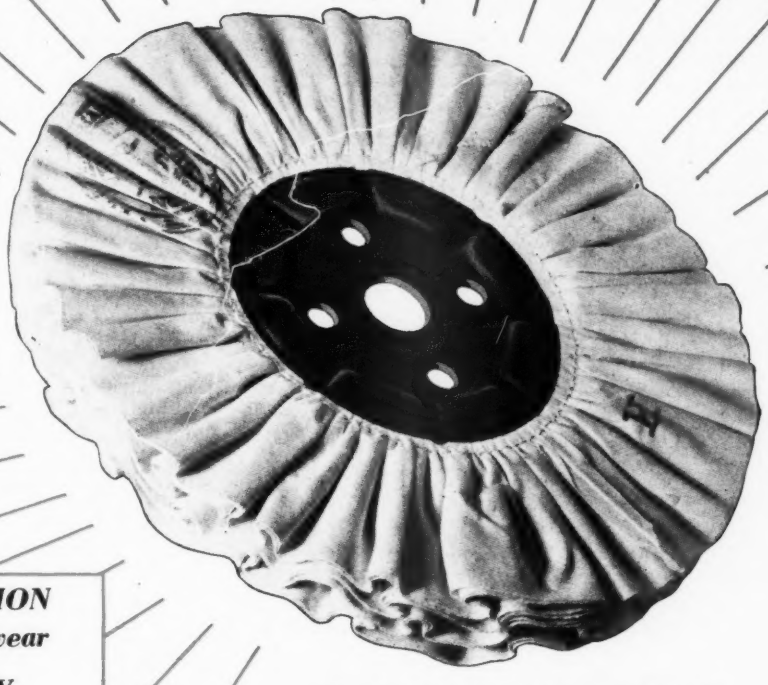
The photograph illustrates the results obtained in actual production with bright nickel plating upon brass. Prior to use of "Actane" in the acid dip, the brass hinges came out of the bright nickel streaked as shown. One ounce per gallon of Enthone "Actane" was added to the acid dip in the cycle, and the plate obtained is illustrated by the specimen on the right. The trouble was not with the bright nickel bath.

"Actane" is said to keep the acid dips in all plating cycles clearer and make rinsing of the acid easier. There is no interference with adhesion of any coating.

E—94. High-Temperature Protective Coatings—Protective coatings able to withstand temperatures of up to 1000° F are now being manufactured by Midland Industrial Finishes Company, Waukegan, Ill. The coating material is formulated with modified Dow Corning Silicone resins and may be pigmented with aluminum. They are said to be competitive with high-grade aluminum paints made with organic resins and to have much superior resistance to heat and outdoor weathering. For further information, use Reader Service Card.

E—95. Electric Acid Pump for Carboys—Faster, safer and more convenient removal of acids, alcohols, belaches and other lifiuids from carboys is claimed possible with a light-weight, portable new Electric Carboy Acid Pump, announced by the Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill.

The Revolutionary New
CODMAN REAL-VENT Nonfray Buff



GREATER VENTILATION
means less waste and wear

GREATER DENSITY
means more production and profits

Codman Real-Vent Non-Fray Buffs are made under the following patent numbers: 2,027,863; 2,094,650; 1,573,961; Re. 19,894; 2,140,208. Other patents pending.

Now, after more than four years of experimental work and development, the F. L. & J. C. Codman Co. takes pride in announcing the REAL-VENT Nonfray Buff . . . with its revolutionary new thin pressed center. Because this new center will not compress, twist or buckle, its ventilating channels retain their original shape under excessive pressures often caused in the tightening of flanges. The thinness of the center results in a much denser face than heretofore possible and yet at the same time produces a maximum of ventilation.

Tests indicate that production may jump as much as 50% with this increase in density and ventilation, resulting in substantial savings to users. For softer wheel requirements, ventilating spacer discs are available. For further information and prices, write today.

THE MARK OF QUALITY

BUFFING AND POLISHING WHEELS OF EVERY DESCRIPTION

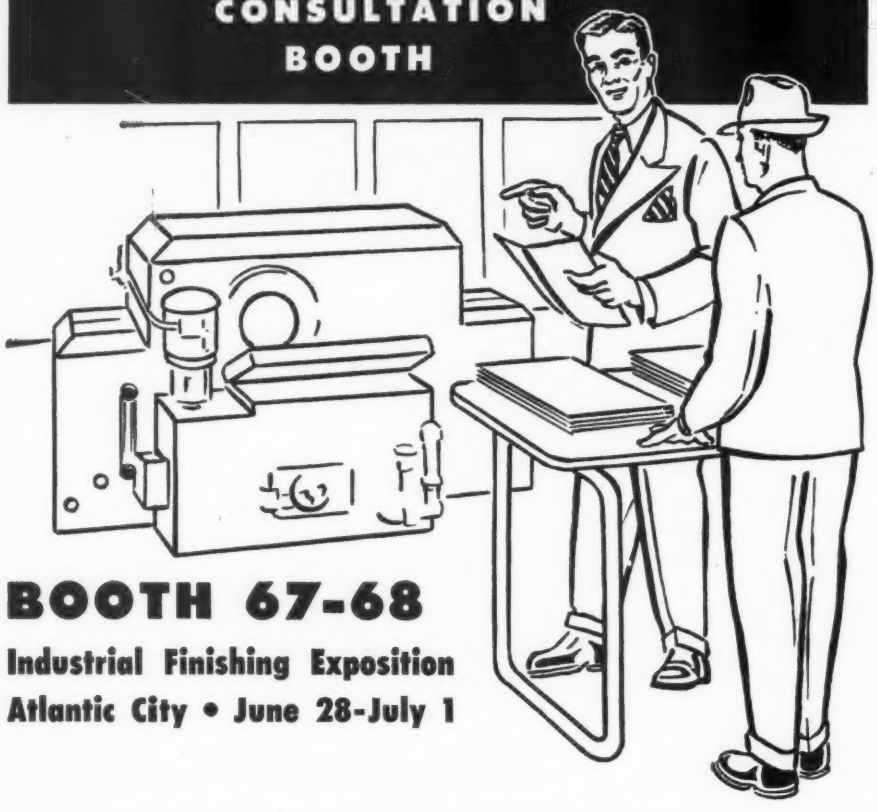
F.L.&J.C.
CODMAN
COMPANY
ROCKLAND • MASSACHUSETTS.

BRANCH OFFICES:
DETROIT, LOS ANGELES
PHILADELPHIA
GRAND RAPIDS

For Over Fifty Years the Greatest Name in Buffs

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 427.

Bring Your
CLEANING PROBLEMS
to the DETREX
CONSULTATION
BOOTH



BOOTH 67-68
Industrial Finishing Exposition
Atlantic City • June 28-July 1

For technical advice on preparation of work for plating and other finishing processes—for the latest information on metal cleaning—visit Booth 67-68 at the Industrial Finishing Exposition. Detrex engineers and laboratory technicians will be on hand, prepared to assist you.

These Detrex men are specialists in every phase of metal cleaning. They'll be glad to help you out of any difficulties you may have—and they'll tip you off to the latest methods of getting more thorough cleaning with greater speed and economy.

In addition, at the Detrex booth you'll see

- ★ **Perchlorethylene Parts Dryer** at work—efficiently removing all moisture from finished parts.
- ★ **Metal Parts Spray Washer** in operation—one of many Detrex machines designed for the plating and finishing industries.
- ★ **Solvent Vapor Degreasing**
- ★ **Alkali and Emulsion Cleaners and Strippers**
- ★ **Spray Booth Coatings and Water Conditioners**

Make the Detrex Consultation Booth your Exposition headquarters for technical help and information. And remember—if you can't attend the Exposition, the Detrex man in your territory will provide the same free consultation service.

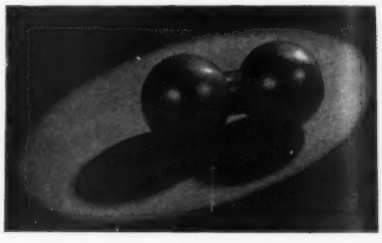
DETREX Corporation
DETROIT 32, MICHIGAN

Equipment and Supplies

Furnished with a 110 V, 60 cycle, AC motor, the pump can be plugged into any standard electrical outlet.

As the Belke Acid Pump is slipped into the carboy, the self-sealing rubber connection seals the carboy neck. Turning on the motor switch causes the compressor to build up air pressure in the carboy, quickly forcing a steady flow of acid through the pipe. The flow of acid can be stopped instantly by pressing the "flow stop" lever which releases the air pressure in the carboy. A pressure release valve prevents the air pressure from going over 30 psi. The only part of the unit which the acid contacts is the pipe. It is easily replaceable and is available in lead, hard rubber or Saran. For further information, use Reader Service Card.

E—96. New Zinc Ball Anode—Introduction of a new "Twin Zinc Ball Anode" priced to give savings ranging up to 8.6 per cent is announced by The Udylite Corporation, Detroit, Mich. The twin



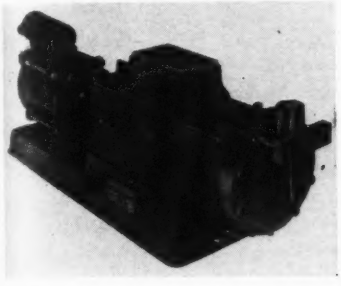
unit is cast by a new high production method resulting in manufacturing economies which have been entirely passed along to Udylite customers. The efficiency of the anode is said to be unsurpassed. For further information, use Reader Service Card.

E—97. New Pressure Filters—Mercury Cleaning Systems, Inc., 549 W. Washington Street, Chicago 6, Ill., offers its new design of multiple plate filter for the pressure filtering of water, paint, varnish, solvents, and plating solutions. It is rated at 1000 gph and can be used in multiple for larger capacity.

This pressure filter represents a departure from the conventional design. Instead of the multiple handwheel arrangement for clamping the lid, the new Mercury Filter employs a spring ring clamp which is tested at 120 psi hydrostatic pressure. This clamp can be removed in an instant and, besides simplifying the opening of the filter for inspection, permits a reduction in the weight of the lid to ten pounds. The clean-out port cover can be removed by a quarter turn of the cover. No wrenches are required. Filter plates and frames and lining can be furnished to accommodate corrosive liquids and solutions. For further particulars and descriptive literature, use Reader Service Card.

New Literature

L—58. Proportioning Pumps for Automatic Solution Control—An 8-page Bulletin No. 262 published by Lapp Insulator Company, Process Equipment Division, 762 Maple Street, Leroy, N. Y.,



describes this company's Pulsafeeder Proportioning Pumps which are available in capacities of from 11 to 660 gallons per hour. For your copy, use Reader Service Card.

L—59. Chemically Resistant Coatings—A newly released descriptive bulletin, issued by Rust-Oleum, Box 110-GI, 2325 Oakton Street, Evanston, Ill., covers products designed specifically for coatings to withstand the action of acid or alkali fumes, condensates, moisture vapors, greases and oils. Back page has a 9-point check list of directions for application of material to both rusted and clean metal. For your copy, use Reader Service Card.

L—60. Electroplating Conveyors—A new 4-page bulletin describes the variable speed, semi-automatic conveyors for electroplating manufactured by Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill. It tells how they increase production, produce high quality plating, save labor, and reduce costs. For your copy, use Reader Service Card.

L—61. Heating Equipment—The Chemical Equipment Division of General Ceramics and Steatite Corporation, Keasbey, N. J., in a 6-page bulletin announces the addition of Impervious Graphite corrosion proof equipment to its line of process apparatus. A full line of apparatus consisting of plate heaters, 7-tube heat exchangers, bayonet heaters, and pipe and fittings will be carried. Impervious to the corrosion of most strong acids and alkalies, highly resistant to thermal shock and with high overall thermal conductivity, this equipment is useful in solving many heat transfer problems including corrosive materials. Specific applications are heating of pickling tanks and heating and cooling of plating solutions. The equipment will be offered both separately and in combination with chemical stoneware and porcelain apparatus. For your copy, use Reader Service Card.

L—62. Grinders and Buffers—Catalog No. 901 of Globe Products Manufacturing Company, 3380 Robertson Boulevard, Los Angeles 34, Calif., describes and illustrates Globe Autostart grinders and buffers, formerly manufactured by U. S. Electrical Motors, Inc. It lists the advantages of asbestos-protected motors and other features of this line. For your copy, use Reader Service Card.

L—63. Fume Separator—A 4-page circular describing the new Niehaus Fume Separator has been published by the manufacturer, Industrial Electroplating Company, Inc., 219 W. Vermont Street, Indianapolis 4, Ind. Typical installations are pictured, and capacities, specifications, and recommended applications are listed. A cross-section view of the Separator shows how it operates by the principles of water absorption and centrifugal separation. For your copy, use Reader Service Card.

L—64. Selenium Rectifiers—Catalog sheets printed in three colors describe in detail six models of Sel-Rex selenium rectifiers manufactured by Bart-Messing Corporation, 45 Morgan Avenue, Brooklyn 6, N. Y.: 150 amperes at 0–8 volts, 500 amperes at 6 to 12 volts, 750 amperes at 12 volts, 1500 amperes at 9 volts, 2500 amperes at 9 volts, 5000 amperes at 9 volts. Complete specifications are given as well as fields of application. For your copy, use Reader Service Card.

L—65. Pickling Chemical—Waverly Petroleum Products Company, Drexel Building, Philadelphia 6, Pa., offers a 4-page Bulletin TR-2, "Troxide with Protectofoam", which describes the dry inert chemicals which after solution in water replace pickling acid. For your copy, use Reader Service Card.

L—66. Pickling Booklet—"Troxide for Pickling and Bright-Dipping Metals" is the title of a 26-page illustrated booklet offered by Waverly Petroleum Products Company, Drexel Building, Philadelphia 6, Pa. It describes the application of Troxide salts to a large variety of base metals for pickling, etching and bright dipping. For your copy, use Reader Service Card.

NEBCO QUALITY BUFFS . . . *all BUFF through and through*

NEBCO Never Uses Substitutes

EFFICIENT, ENDURING—From Top Quality Materials

BUFFS for Every Type of Work and to Specifications

CUTTING and POLISHING for All Types of Finishing

OVER FIFTY-SEVEN Years of Manufacturing and Service to the Metal Finishing Industry

"For Over 57 Years —Since 1890—We Have Been Manufacturing Buffs of Every Description."

NEW ENGLAND BUFF CO.

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NEW ENGLAND BUFF CO. NEBCO PRODUCTS SINCE 1890 BOSTON, MASS.

New Literature

L—67. Industrial Protective Clothing—A 12-page catalog section published by B. F. Goodrich Company, 500 S. Main Street, Akron 18, Ohio, pictures and describes rubber and Koroseal garments including acid proof apron, sleeve protectors, work suit, film industrial apron, and heavy duty apron. Rubberized products (coats, suits, leggings, gloves, etc.) are also shown. For your copy, use Reader Service Card.

L—68. Ventilating Equipment—Offered production men is a collection of bulletins issued by Chelsea Fan and Blower Company, Inc., 1206 Grove Street, Irvington 11, N. J.: 22 pages in 12 sheets in a handy folder, graded for easy reference and filing. It covers fans, blowers, and exhausters for industrial, commercial and domestic installations. Also circulators, louvers, penthouse units, accessories, etc., together with specifications and prices. For your copy, use Reader Service Card.

L—70. Industrial Lighting Specifications—The recently published RLM specification guide for buyers, specifiers and sellers of industrial lighting equipment, has just been reprinted according to the RLM Standards Institute, 326 W. Madison Street, Chicago 6, Ill. Entitled the "RLM Standard Specifications for Industrial Lighting Units", this 36-page booklet contains detailed specifications for fourteen of the most commonly employed incandescent and fluorescent lighting units. Specifications cover materials, shielding and brightness, efficiency, acceptance criterion, auxiliary control equipment, ballast temperatures, construction, reflection factor, photometric performance, National Electric Code requirements and many others. It is available without charge to all interested in the proper planning of lighting for industry, business, institutions, etc. For your copy, use Reader Service Card.

L—74. Cleaning Method—An attractive new bulletin describing the Kleneezy Parts Cleaning Machine and method of cleaning parts, whether in metalworking plants or garages and repair shops, has been published by the Cincinnati Cleaning and Finishing Machinery Company, Ironton, Ohio. For your copy, use Reader Service Card.

L—75. Rust Protection of Sub-Assemblies—Oakite Products, Inc., 157 Thames Street, New York 6, N. Y., has announced the publication of a new Service Report providing helpful data concerning Oakite Special Protective Oil, a specialized material designed to furnish efficient rust-protection of metal parts in production, in storage, or while awaiting shipment.

Oakite Special Protective Oil is a semi-permanent, rust-preventive oil of extremely low viscosity which displaces water, frequently eliminating the necessity of a drying operation, and imparts a thin, protective film to ferrous surfaces, resisting moisture, humidity, perspiration and acid fumes. Metal surfaces treated with this material and subjected to rigid humidity and acid-fume tests, show no evidence of corrosion, it is reported. The report incorporates a flow chart showing strategic points in the production process where Oakite Special Protective Oil supplies effective anti-rust protection. For your copy, use Reader Service Card.

L—72. Humidity Control—American Instrument Company, 8030 Georgia Avenue, Silver Spring, Md., offers a new 28-page Bulletin N-2164 which describes its complete line of "Electric Hygrometers for High Precision Humidity Measurement and Control". It should be of particular interest to those who have blushing problems in lacquering or problems with corrosion from moisture condensation. For your copy, use Reader Service Card.

L—73. New Line-operated pH Meter—Bulletin N-4 of American Instrument Company, 8030 Georgia Avenue, Silver Spring, Md., describes its new line-operated Macbeth *p*H Meter for use in manufacturing control or development work. This continuously indicating instrument has a range of from 0 to 14 *p*H, an accuracy of 0.1 and a sensitivity of 0.05 *p*H units. Features include built-in voltage stabilizer and complete sealing of all working parts. For your copy, use Reader Service Card.

ANNOUNCING

Divine

BELTFLEX

CONTACT WHEELS

SEE THE DIVINE LINE

BOOTH 25-26

INDUSTRIAL FINISHING EXPOSITION

ATLANTIC CITY—JUNE 28-JULY 1

Give positive polishing action on light contour and radius work where resilient action is necessary.

FLEXIBLE—They mold the belt to the work surely and effectively.

BALANCED—for smooth running, and to give constantly accurate pressure to the working surface. A smoothly ground face assures uniformity.

TWO DEGREES OF DENSITY—one offering greater flexibility, the other more aggressive cutting action . . . both giving pliability and resilience beyond standard contact wheels.

WIDE SIZE RANGE—face widths and diameters for most requirements. Wheel equipped with metal hub. Generally most effective when used with Jeans Cloth (J weight) belts.

Divine Brothers Company

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COME

TO THE

ROTO-FINISH

BOOTH NO. 164

FINISHING SHOW
ATLANTIC CITY
JUNE 28—JULY 1

SEE

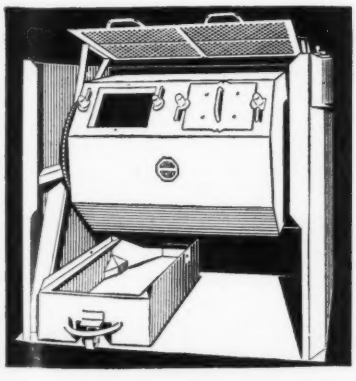
HOW YOU CAN FINISH PARTS MECHANICALLY

- **CUT LABOR COSTS**
- **SAVE TIME!**

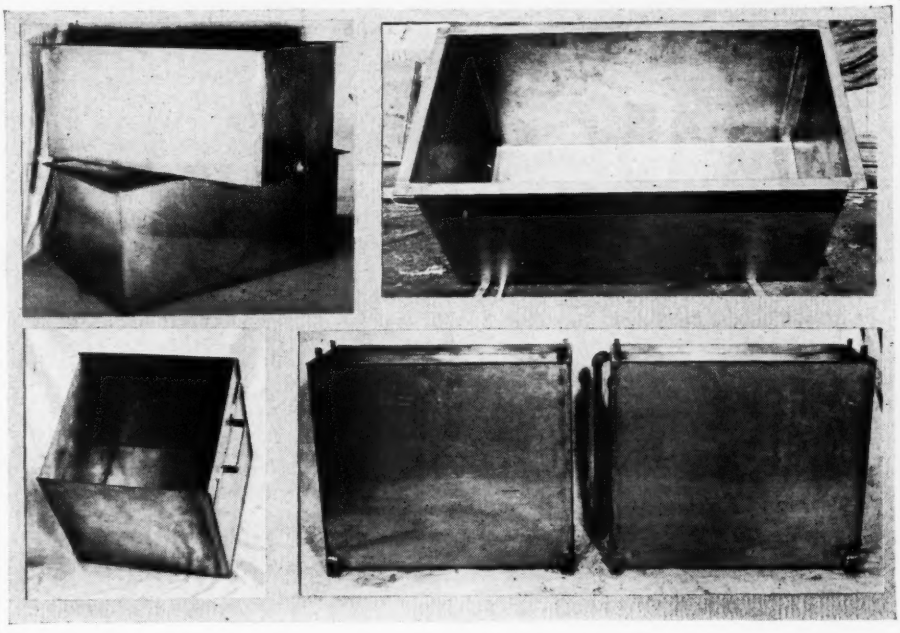
Produce semi-lustrous finish on stampings, machined parts, die castings, forgings, extrusions for automotive, building, plumbing, appliance, general hardware, fishing tackle, tools, business machines.

Roto-Finish speeds finishing operations. Eliminates hand labor. Produces surface uniform on all pieces. De-burrs as well as finishes.

Send parts for sample processing!



THE STURGIS PRODUCTS CO.
407 Jacob Street
Sturgis, Michigan



The buyers of these tanks chose material for long-time utility

Monel is their permanent safeguard against corrosion failures and replacement expense

OVER and over again Stortswelded Monel tanks have proved to be the wisest choice, defeating severe corrosive attacks and showing maximum production utility value for the conditions. Illustrated above are a few examples from a great variety of shapes and sizes that have been fabricated to meet the special needs of Storts customers.

Some requirements indicate the need for solid Monel. In other cases, steel tanks with Monel linings or tanks of Monel-clad steel will give adequate corrosion resistance at a worthwhile saving over the use of the solid metal. Storts fabricates all three types.

Other types of semi-precious metal fabrications can be furnished just as readily. Storts engineers are prepared to furnish dependable counsel on the material that is most suitable for your tanks, either in single units or complete tank cycles.

STORTS WELDING COMPANY
INCORPORATED
42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specifications

and still a GOOD DIP

Thousands of Jelliff baskets of all sizes, give unusual service under a wide variety of conditions. Jelliff baskets are designed and engineered to provide maximum performance and economy on the job. Special types can be produced to specifications in the Jelliff plant with its complete facilities for drawing, weaving and fabricating. Available in aluminum, brass, copper, monel, steel, stainless nickel and other metals and alloys.

Write DEPT. L212 For Literature

DIPPING BASKETS • LEKTROMESH • RESISTANCE WIRE • WIRE MESH PARTS • WIRE CLOTH • STRAINERS • FILTERS

The C. O. JELLIFF MANUFACTURING CORPORATION

SOUTHPORT, CONN.

WIRE PRODUCTS SINCE - 1880

A. E. S. News

(*Continued from page 629*)

BACK VOLUMES OF A.E.S. PUBLICATIONS

We are pleased to acknowledge with thanks receipt of a substantial number of back copies of THE MONTHLY REVIEW and the *Proceedings* from Mr. Edward W. T. Faint (Newark Branch), Mr. David B. Garfinkel (New York Branch), Mr. Carl E. Heussner (Detroit Branch) and Mrs. George Gehling, wife of the late Past President and Honorary Member of the Society.

These back volumes will help in the establishment of files of Society publications in libraries of Branch cities which has become such an important function of the Society.

A. E. S. RESEARCH COMMITTEE MEETS

The Research Committee of the American Electroplaters' Society, which is charged with the responsibilities for the Society's extensive research program, met on March 26 in Hotel Stratfield, Bridgeport, Conn.

Invited guests were Dr. W. C. Moore, Past President of the Electrochemical Society; Messrs. Ray O'Connor and J. A. Badaluco, Past Presidents of Bridgeport and Grand Rapids Branches, A. E. S., respectively, and Mr. W. J. Cullen, President of Hartford Branch, A. E. S.

Dr. Louis Weisberg, Consultant, New York City, was elected chairman of the Research Committee for the year 1948–1949, succeeding Dr. R. M. Wick of Bethlehem Steel Company, who ably filled this post during the current year.

The Committee approved the newly designed Sustaining Membership Certificates. They will be mailed to the sustaining members during the month of April.

Excellent results were reported obtained by a number of the projects. They will be published in a series of articles which will appear in the next few months in PLATING.

The Committee will have two booths at the Industrial Finishing Exposition in Atlantic City. Several fine displays are being prepared to demonstrate the accomplishments of the projects.

Another meeting will be held during the A. E. S. Convention during the week of June 28. There will also be a Research Committee breakfast for the members of the Committee, its Sub-Committees, Project Committees, and Project Staffs. This will be held on Wednesday, June 30, immediately preceding the session devoted to A. E. S. Research.

with HAVEG

If you need a non-metallic material with physicals such as strength, toughness and durability PLUS 100% corrosion resistance, investigate HAVEG.

This versatile molded material, resistant to chemical action *throughout its entire mass,* is ideal for structural uses. Tanks, towers, and other large structurally strong equipment can be molded in one piece at nominal cost and delivered in from one to eight weeks.

For complete information on how this unusual material can help improve performance and reduce costs on your applications, drop us a line for HAVEG Bulletin F-4.

HA 3-4

HAVEG CORPORATION
NEWARK 1, DELAWARE

CLEVELAND 14 CHICAGO 11 HOUSTON 6 DETROIT 11 LOS ANGELES 12 SEATTLE

It's NEW!

and superior by every standard of comparison . . . and costs less!

MICCROSOL

E-1003

HEAT-CURED RACK COATING

• Now, the MICCRO laboratories have developed a single-dip heat-cured rack coating that offers, in addition to positive insulation and protection: (1) amazing tensile strength and scuff resistance, (2) permanent flexibility, (3) positive and continuous adhesion, (4) simplicity of application, (5) savings in time, labor, and material . . . a major objective of chemical engineers for years. This new coating is MICCROSOL E-1003.

• MICCROSOL E-1003 is the exclusive product of Michigan Chrome and Chemical Company, developed and manufactured in our own plant with the same technical skill and knowledge that has made all MICCRO products outstanding in the plating industry.

• Look at the chart! This exhaustive test analysis reveals the marked superiority of MICCROSOL E-1003 in every important factor of comparison. In addition, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show equally amazing results.

• MICCROSOL E-1003 is a 100% solids non-evaporating material that produces a smooth, tough, leather-like coating with a single application that will often outlast the life of the rack. Racks are completely processed and ready for use in approximately 2 to 4 hours.

• For further information write for detailed bulletin on Miccrosol E-1003.

YOU ASK FOR FIGURES? HERE THEY ARE!

Comparison of MICCROSOL E-1003 with three other well-known coatings.

Tests	Miccrosol E-1003	Coating A	Coating B	Coating C
Tensile Strength	3400#	2600#	2000#	1600#
Adhesion	125#	40#	25#	35#
Hardness Durometer "A"	80-85	70	52	50
Tear Strength	650#	450#	350#	250#
Elongation	250%	350%	400%	450%
Recovery	99%	99%	99%	100%
Solids	100%	100%	100%	100%

MICHIGAN CHROME
and Chemical Company

6351 East Jefferson Avenue • Detroit 7, Michigan

MICCRO Products

Developed and Manufactured by Experienced Platers

Electroplating MOTORS GENERATORS

in stock
Reliably Rebuilt
with our
1 YEAR GUARANTEE

6/12 Volts

1—8000/4000 Ampere, H-V-W Synch. M. D. 300 RPM
1—6000/3000 Ampere, Chandeysson Synch. M. D. 400 RPM
2—6000/3000 Ampere, B. & O'C. with Chandeysson synch. motor, 450 RPM
2—5000/2500 Ampere, B. & O'C. with Chandeysson synch. motor, 450 RPM
1—5000/2500 Ampere, Columbia, 690 RPM
1—2000/1000 Ampere, H-V-W, 690 RPM
1—1250/625 Ampere, H-V-W, 850 RPM
1—1000/500 Ampere, Chandeysson, 690 RPM
1—1000/500 Ampere, Columbia, 1150 RPM
1—1000/500 Ampere, H-V-W, 1150 RPM
8—125 Ampere Hobart, 6 volts

12/24 Volts

1—1000/500 Ampere, H-V-W synch. M. D. 900 RPM

10 V. to 60 V. Single Commutator

1—200 Ampere, 11/15 V. Gen. Elec.
1—180 Ampere, 14/18 V. Gen. Elec.
1—200 Ampere, 15 V. Master
1—1000 Ampere, 15 V. Gen. Elec.
1—300 Ampere, 15 V Star
1—800 Ampere, 22/33 V Gen. Elec.
3—1500 Ampere, 24 V Elec. Prods.
1—67 Ampere, 24 V. West.
1—600 Ampere, 24 V. Reliance
1—200 Ampere, 25 V. Star
1—1000 Ampere, 25/35 V. Diehl
1—300 Ampere, 25 V. Star
1—175 Ampere, 25 V. Cr. Wh.
1—500 Ampere, 32 V. Columbia
2—100 Ampere, 30 V. Gen. Elec.
1—200 Ampere, 30 V. West.
2—200 Ampere, 32 V. Gen. Elec.
2—1500 Ampere, 32/40 V. Elec. Prods.
1—1000 Ampere, 33 V. Gen. Elec.
2—200 Ampere, 42 V. Gen. Elec.
3—1500 Ampere, 45 V. Century
1—1500 Ampere, 50 V. Gen. Elec.
2—800 Ampere, 50 V. Gen. Elec.
1—400 Ampere, 50 V. Gen. Elec.
6—1500 Ampere, 50 V. Elec. Prods.
1—1000 Ampere, 60 V. Gen. Elec.

L. J. LAND, Inc.
136 GRAND STREET
NEW YORK 13, N. Y.
Established 1910
CAnal 6-6976

MEMBERSHIP REPORT

The Branches of the Society are divided into three groups according to the size of their membership. Each Branch which tops its group in per cent net gain during the fiscal year receives an appropriate prize. Members gianed or lost by transfer from one Branch to another are counted one-half points only.

BRANCH	Membership May 1, 1947	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
PITTSBURGH	126	30	+23½	+18.6
LOS ANGELES	195	62	+36	+18.5
CHICAGO	410	86	+45	+11.0
HARTFORD	140	14	+12	+ 8.6
NEWARK	253	46	+20½	+ 8.1
PHILADELPHIA	191	37	+15	+ 7.9
NEW YORK	257	31	+14	+ 5.4
BRIDGEPORT	147	21	+ 8	+ 5.4
TORONTO	136	18	+ 7	+ 5.1
BOSTON	156	36	+ 7	+ 4.5
GRAND RAPIDS	138	39	+ 1½	+ 1.1
CLEVELAND	190	25	....	....
DETROIT	418	78	−12	− 2.9
SECOND GROUP				
ROCHESTER	87	31	+32½	+37.4
ST. JOSEPH VALLEY	88	18	+ 9½	+10.8
ST. LOUIS	96	7	+ 6½	+ 6.8
WATERBURY	126	6	+ 1½	+ 1.2
SAN FRANCISCO	76	9	+ ½	+ 0.7
BUFFALO	98	13	....	....
INDIANAPOLIS	103	26	....	....
DAYTON	95	10	− 1	− 1.1
NEW HAVEN	114	10	− 1½	− 1.3
MILWAUKEE	124	16	− 4	− 3.2
PROV.–ATTLEBORO	126	27	− 8	− 6.3
TWIN CITY	90	11	−13	−14.4
BALTIMORE-WASH.	117	12	−20	−17.1
THIRD GROUP				
CINCINNATI	55	26	+23½	+42.7
ADELAIDE	49	19	+17	+34.7
LANCASTER	38	12	+ 8	+21.1
TOLEDO	55	28	+11	+20.0
SYDNEY	78	21	+12½	+16.0
SOUTHEASTERN	43	13	+ 6½	+15.1
MELBOURNE	60	28	+ 7	+11.7
COLUMBUS	35	9	+ 3	+ 8.6
SPRINGFIELD	49	8	+ 4	+ 8.2
MONTREAL	59	8	+ 3½	+ 5.9
SYRACUSE	73	5	+ 3½	+ 4.8
JACKSON-LANSING	65	12	− 1½	− 2.3
ROCKFORD	64	4	− 3½	− 5.5
OTHERS	78	72	+75	+96.2
TOTAL A. E. S.	4,898	984	+351	+ 7.2

Active Membership, April 30, 1948 5,249